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Electrical Review

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Industrial Relations.

POSSIBLY those of our readers who make a regular and anxious study of the periodical stream of literature and the floods of oratory regarding the means by which improved relations may be brought about in our sorely-tried British industries, will have noticed that less space has been devoted to the subject lately in these pages than was the case a year or two ago.

There were some five or ten years when the embankments were broken by the overflow of proposals, lectures, and newspaper reports of speeches, some idealistic, others depressingly practical, and others violently revolutionary. Little good came of most of them, but we suppose that history will count some of them as having in some degree contributed to our success in muddling through. We had to record and comment upon them at the time and might wish to forget all about them now, were it not that the latest movements seem to be so very similar in purpose and in plan. Every middle-aged man has reached the time when, because experience has brought disillusion and greater placidity in regard to many affairs of life, he and his contemporaries have been accused by their younger associates of exercising a braking influence upon the rate of progress. Is it then to be wondered at that, when close observation of the failure of countless suggestions, schemes, alliances and conferences has proved the necessity for looking further in order to find the real palliative, we have been strictly on our guard when any new group of men or women have come forward with proposals? Let it not be imagined for one moment that we despair of real agreement and high prosperity being reached sooner or later, or that it will pass the wit of man to bring about a spirit of common brotherhood in industry, either national or international. Both national and international industry have changed, and in the next ten years or so may change far more under democratic influences. We welcome the comparative calm of 1927 and 1928 after the heavy clash of arms of 1926, but we are confessedly anxious regarding the measure of success that may be expected early to attend the latest efforts to find peaceful

industrial ways for the future. We give our most cordial good wishes to the conferences that are now taking place—or to be more correct are *being prepared for* by committees of both sides—and are interestingly discussed to-day on another page of the ELECTRICAL REVIEW under the title "Thoughts on Industrial Peace," by Mr. J. W. Thomas. We have consistently advocated the cause of the Industrial Council and the Works Committee as effective means of preserving peace. It has been in the industries where these have existed that there has, as the author states, been the greatest absence of industrial strife. But what Mr. Thomas and everybody who is delivering himself in public regarding the present conferences are agreed upon is the platitude that "the right atmosphere" is the first great essential if real co-operation is to be reached. Now this need of the right atmosphere is what some of us have emphasised almost as long as we can remember. It always has been essential; sometimes it has seemed to be coming—then there has been a human flare-up; it seems to be coming now if we can believe our ears or read the signs, yet side by side on our desk lie the article of Mr. Thomas, a demand from the engineering workers for an advance of eight shillings per week, one from the shipbuilding workers for ten shillings more, reports of a deadlock in the textile trade, and of serious disagreement in the tin-plate trade. If there is one hopeful sign at the moment, it is the placing of the silencer upon the tyrant agitator, but nobody will be so blind as to fail to see in that a mere temporary relief. We need to find, if possible, some common basis of agreement to which Capital, Labour, *and Management* are parties. If there is, as we think there is, a better atmosphere already, we must endeavour to secure both its improvement and its permanence so that the growth of trade may continue to bring happiness and prosperity to our people. Atmosphere may not be a substantial article of food, but it may have a great deal to do with the amount of work that we are able and willing to do; and as we said when the war ended, nothing but real hard work would bring us through.

The operations of the Mond Conference will have the prayers and good wishes of all desiring to find an end to our industrial troubles, but inevitably the proceedings must be slow, the difficulties great, and progress toward Utopia or the Millennium will only be made by an all-round recognition of the common rights of every human being and in the existence of a better atmosphere. As somebody said the other day in a broadcast speech you "must go through the mill in order to arrive at the millennium." No conference, and no political party, can bring immediate changes in the practical operation of industry. It is our profound belief that advance can only be made step by step, gradually by trial and error practice, and even then new world movements may be occurring to cut across our home decisions.

The Weather and the Electrical Industry.

WHEN the foreigner seeks a reason for some of our most outstanding characteristics as a race, and makes us stand abashed at his recital of what he regards as points of British superiority, doggedness, tenacity, indifference to trifles, and so forth, credit is frequently given to the part played by the elements in allowing these islands to be visited by weather of wonderful variety and unreliability. To purchase a macintosh is a direct invitation to a drought, buy skates and you immediately produce a thaw—what a delightful theme for the indulgence of the imagination were this the place! Now if we have ever had a more than usually trying winter, it has been that of 1927-1928; perhaps it has got "on the nerves" of people, and when too many suffer in that way in their common meeting places—well, like the course of true love things do not run very smoothly. It may be nothing whatever to do with the weather, but we know that every few days some rumour or report gains currency suggesting that in many parts of the electrical industry a new Mond Conference might find a use for conciliatory counsel. We are not referring to any one matter in particular—merely expressing a longing for the bloom of the apple and the cherry tree, the laburnum and the May.

Motors for Artificial Silk.

THE phenomenal progress that has been made by the artificial silk industry in the last few years has been largely due to the efforts of engineers. The finishing and dyeing plants used for cotton and silk have been modified in design by the textile machinists to suit artificial silk, while new winders have been evolved, the principles of operation of which have been identical with those used for cotton, but the constructional details have been altered to suit the more delicate fibre. Artificial silk yarn has been very successfully spun on ordinary cotton machinery with minor adjustments, but better results are obtained with specially designed machines. In this field the individual motor drive is considered the most efficient because there is a minimum of vibration, but objection is made to the individual motor that there is sometimes difficulty when starting; some types start at too high a speed for the very delicate fibre.

It is considered that if a perfectly satisfactory centrifugal spinning motor were designed, the centrifugal method of spinning artificial silk would become general. The motor and the spinning pot in which the glass funnel moves up and down must be combined, winding the cake of yarn spirally inside the pot. To obviate vibration, as can be appreciated, is essential, and as pot and motor are virtually suspended in air, gyroscopic principles must be adopted. It may be well to quote from an authority who explains this principle of spinning: "The necessary twist is given to the thread in the process of pot spinning and the speed is regulated as required. Five thousand revolutions per minute and higher is attained, and it is increasingly difficult to avoid the fatal vibration. This difficulty has, however, been fairly well overcome and does not provide the greatest problem now. In the next place it is apparent that with a box revolving at this speed and winding a fibre which has just been freed from an acid bath, the motor is subjected to considerable risk of corrosion and many difficulties have arisen in finding the correct materials, and the right way of applying them to the protection of the motor from the danger of the corrosive acids. Furthermore, these spinning machines must be constructed to give twenty-four hours per day service for at least six days on end and the consequent strain on the various parts is exceedingly great." There is not universal agreement that the individual drive is the best, but it is, we think, making most headway.

The Testing of 33,000-V Cables.

IN our "Correspondence" columns to-day will be found the considered reply of Mr. M. Höchstädter and Dr. E. Bowden to the letters commenting on their article which were published during December last; the delay has been due to the North Sea, by which they are normally separated. Whilst they state their grounds for demurring to several of the proposals advanced by their critics, they show a disposition to accept others, with or without modification, and we hope that the outcome will be a simple code of tests which, for a time at least, will gain general recognition as being reasonable and commercially practicable.

We say "for a time" because it is clear, not only from this correspondence but also from other recent publications on the subject of 33,000-volt cables, that what we don't know about the behaviour of dielectrics in strong electric fields far exceeds what we do know. We do not for a moment wish to disparage the splendid work that is being done in research laboratories and—often, perhaps, unintentionally—in the field, but merely to state a fact which has a very direct bearing on the subject. For instance, Messrs. Höchstädter and Bowden state that our knowledge of the fundamental laws which govern the relationship "breakdown-time," the mechanism of breakdown under d.c. and a.c. pressure, and the passage of direct current through the dielectric, is incomplete. Much of the uncertainty that prevails regarding these questions doubtless arises from the necessity of employing organic materials for cable insulation, the composition and characteristics of which cannot be determined with the same precision as in the case, say, of the copper and lead with which they are associated. Moreover, experimental research in this connection is hampered by the difficulty of reproducing the conditions that obtain in practice, and observation is frequently vitiated by the instant destruction of the affected materials when a fault occurs.

Nevertheless, remarkable progress has been made, and the fact that there is still plenty of scope for inventive genius is evidenced by recent innovations in the design of cables, just as it has been in the fields of fuel combustion and submarine cables.

How to Use Electric Lamps.

Although the electric lamp is now in universal use, the intricacies of its construction and the extremely high degree of manufacturing accuracy to which each of its components has to conform are prone to be overlooked. It is only reasonable to expect that an article which has to be manufactured with so much care, will not give its best service unless it is used in accordance with the purpose which its designer had in view. In designing lamps, consideration is given to the fact that most lamps are burned with the cap uppermost, as in this position it is generally found that they give better results than in other positions. With the cap uppermost, the supporting wires are designed to carry the filament in a state of suspension, which is the most favourable condition for longevity as well as for downward illumination.

Although ordinary lamps can be burned cap downwards, as for example in reading lamps, and in horizontal positions in bracket fixings, without serious consequences, it is unreasonable to expect them to function as efficiently as they would do if they were burned in the positions for which they were designed.

Special types of lamps, such as projector lamps for use in photographic enlargers, optical lanterns, &c., *must* be burned in the correct positions; their design is such that this is imperative, as burning them in incorrect positions may result in immediate lamp failure. This being so, a word of warning to purchasers against using such lamps in positions other than those for which they are designed, is timely.

Electric Shock Accidents.

Several shock accidents were reported last week, two of which, unfortunately, were fatal. In one case an electric radiator fell into a bath, and a child was killed. We have often drawn attention to the fact that the bath-room is the danger-spot in an electrically-equipped household; almost all the accidents recorded in homes have taken place in bath-rooms, and we maintain that *no portable electrical appliance* should be used there. Our readers know this well enough; we hope that contractors and others who come into contact with non-technical users of electricity will warn them regarding the risk, which also is present, though in somewhat less degree, in sculleries, wash-houses, and cellars, where earthed metal is exposed or the floor is damp. It will be urged that three-pin plugs as specified in the I.E.E. "Regulations" remove the danger, but we do not agree; there is and can be no certainty that the earthing connection is intact and effective, however carefully the original installation was carried out. Moreover, it is very doubtful whether the use of the earthing connection in this unique instance would have prevented the fatality, even if the earthing circuit had been in good order.

Our contention is supported by another accident, in which a man was killed by receiving a shock from a live lift lock, the earth wire being broken. We have little confidence in the continuity of earth wires, unless they are short and stout, and are periodically tested—a precaution which is rarely taken in domestic installations.

A third case was that of a woman who was endeavouring to throw a broken overhead wire into a field, when the current, which had been cut off, was turned on at the power station. Fortunately the consequences, though unpleasant, were not serious.

To guard against such accidents, instruction should be given in schools; the children should be warned never to touch broken wires, or to climb poles, or to fly kites or throw wires over aerial lines. That is an effective method of safeguarding not only the children but also their parents, to whom they pass on the warning. This method has been adopted widely on the Continent, with good results, and it is very desirable that similar steps should be taken in this country.

Glasgow Corporation Electricity Department.

Those who have followed with respect and admiration the progress of the electricity supply department of the Corporation of Glasgow during the past quarter of a century will have learned with pained surprise that a highly accusatory report has been drawn up by a sub-committee, appointed to inquire into the administration of the department, and has been endorsed by the Electricity Committee. It will come before the Council next week. In the meantime, it is important to bear in mind that no opportunity has been afforded to the engineer and manager of the department, Mr. R. B. Mitchell, to make a statement on the subject of the report, which apparently was issued as a "Private and Confidential" document—though it has received a full measure of publicity in the local Press. We have no doubt that Mr. Mitchell will be able to meet effectively the criticisms of the sub-committee, so far as they relate to his office, and we may add that the report contains no suggestion in any way reflecting upon the honour of any person, or of the Electricity Committee.

Broadly speaking, the charges may be summed up as an accusation of extravagance and uneconomical administration, and although they have been endorsed by the Electricity Committee, they are in fact directed against the policy and practice of the Committee itself, over a long period of years. For instance, the original contracts for the generating plant at Dalmarnock, planned in 1914 for an ultimate capacity of at least 140,000 kW, included five sets of 15,000 kW each, capable of a maximum output of 93,750 kW, the existing plant at Port Dundas being rated at 20,000 kW; one of these sets is out of commission, being rewound, and as the peak load this winter has exceeded 107,000 kW, it is obvious that even with two additional sets ordered in 1923, the capacity of the plant is not excessive. The Dalmarnock site was purchased before the war; part of it is being levelled up with ashes, a sound reason for using it as a dumping ground, and we believe there are equally substantial answers to the other comments of the sub-committee.

The origin of the inquiry is probably to be found in the fact that the department made a loss of £97,000 in the year 1926-27, owing to the cost of coal during the dispute of 1926 having been £200,000 more than was allowed for in the estimates. The Gas Department in the same period is said to have made a loss of nearly a million sterling! Is an inquiry to be held into its administration?

The Post Office (London) Railway.

Descriptive details of an underground electric railway designed for accelerating the conveyance of letters and parcels and contributing to the reduction of surface street traffic; the novel method of automatically operating the driverless trains is probably unique.

IT will be recalled that the Committee appointed in 1909 by the British Post Office to consider the desirability of replacing the road-van mail-transport service by an improved method of conveying letters and parcels between the principal post offices and railway stations in London, with a view to accelerating the service and simultaneously contributing to the reduction of street traffic congestion, concluded that the best results would accrue from the construction of a tube railway, electrically operated automatically, so that the driverless trains could be controlled from cabins at the loading stations along the line.

A scheme embodying the above idea was accordingly prepared, and tenders for carrying out the civil engineering work were invited in 1912: the contract for the tunnelling was entrused to John Mowlem & Co., Ltd., and that for the construction of station platforms and permanent way to Charles Brand & Son. Tunnelling commenced in October, 1914, and was practically completed in 1917, but the fact that the prices ruling during the war period threatened to adversely affect the economic soundness of the scheme, compelled the cessation of activity until 1924, when contracts were placed for the electrical equipment, rolling stock, &c.; the station platform and permanent-way contract was commenced in December, 1925.

Mr. Harley H. Dalrymple - Hay, M.Inst.C.E., is the consulting engineer for the civil engineering work and track construction, a similar function having been exercised in the case of the equipment by Sir John F. C. Snell, G.B.E., M.I.E.E., until his appointment as Chief Electricity Commissioner in 1919; since then Mr. A. M. Sillar, M.Inst.C.E., M.I.E.E., has acted in that capacity. Major H. C. Gunton, M.B.E., M.I.E.E., principal power engineer of the Post Office, representing Col. T. F. Purves, O.B.E., M.I.E.E., engineer-in-chief, in conjunction with Mr. Sillar, has been responsible for the electrical equipment, rolling stock, conveyors, and lifts, assisted by Mr. W. H. Powell, M.I.E.E., and Mr. J. R. Kingston, O.B.E., M.I.E.E., to all of whom we are indebted for assistance in the preparation of this article. Mr. Evan Evans (whose services have been temporarily placed at the disposal of the Postmaster-General for the purpose by London Underground Railways, Ltd.) occupies the position of manager of the P.O. railway, and the employment of containers was amongst several improvements that have been incorporated at his suggestion. Major W. G. Carter, M.C., M.I.E.E., of the P.O. Engineering Department, is the executive engineer, and is responsible for the maintenance of the railway.

The extent of this novel tube railway, which was recently opened for mail traffic, is indicated on the accompanying map (fig. 1), the dotted lines showing possible future extensions; the total length of railway, as at present constructed, is 6½ miles, and it is the first permanent 2-ft. gauge railway in this country. The minimum size of the tunnel between the stations accommodating a single track is 7-ft. internal diameter: in order to run both tracks in one tunnel between the stations, the minimum size on straight runs, assuming that no curves would have a radius less than 400 ft., was made 9 ft. internal diameter; as, however, the platforms are of the "island" type, two short 7-ft. tunnels were constructed at each station. In the stations themselves, accommodation had to be provided for the platform line as well as a through line, and at the West Central District Office, Mount Pleasant, and King Edward Building, for a running-round loop line as well, making three tracks in all; at such three-track stations the internal diameter of the tunnel is 25 ft., while at the other stations it is 21 ft. 2½ in. (figs. 5 & 6).

Generally, the running tunnels were driven with the aid of the ordinary Greathead shield, and the short lengths forming the stations were excavated by hand mining, the whole being grouted with pure Portland cement. Permanent shafts at all stations give access to the platforms by means of conveyors, lifts, and staircases, from the basement level of the various Post Office buildings and main-line railway stations; in addition, conveyor subways have been provided at Paddington, Liverpool Street, and Mount Pleasant. Intercommunication between the island platforms is obtained by cross-passages, while other works include the lay-by sidings at each end of the stations at Paddington, King Edward Building, and the Eastern District Office, as well as at the eastern end of Mount Pleasant station, where the car depôt is located. The running rails are of British standard section No. 35, weighing 35 lb. per yard, screwed to oak sleepers embedded in the concrete.

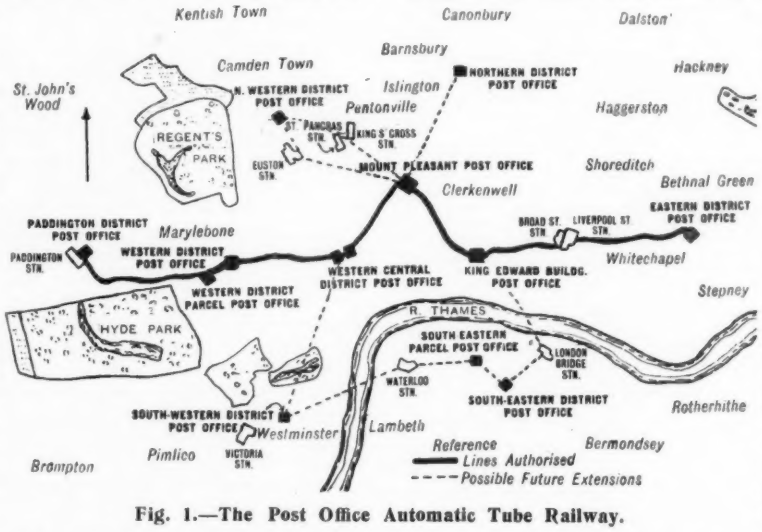

Fig. 1.—The Post Office Automatic Tube Railway.

The main contract for the electrical equipment was let to the English Electric Co., Ltd. The e.h.p. and l.p. cables, other than those incorporated in the control system, were supplied by British Insulated Cables, Ltd., as sub-contractors. The track equipment proper, for which Robert W. Blackwell & Co., Ltd., subcontracted, includes a mild-steel conductor rail of channel section, weighing 15 lb. per yard and with a resistance of 1.8 microhm per yard, supported on insulators about 8 ft. apart. Two bonds are used for each conductor-rail joint, and the track rails, in addition to being bonded at the joints, are cross-bonded at intervals of about 100 yards and are connected to the cast-iron tunnel lining. The conductor rails are divided into sections, and one of the track rails is track-circuited throughout to form a control section: in order to increase the capacity of the earth return,

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Dear Sirs,

We have examined your books for the year ended 31st December, 1927, and certify that the net sales, after deducting returns, have averaged 11,839 copies per week, in addition to which there were issued to Foreign Consuls and Advertisers an average of 1098 copies per week, making a total circulation of 12,937 copies per week.

Yours faithfully,
W. B. Keen & Co.,
Chartered Accountants.

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with a view to keeping within the voltage drop recognised by the Board of Trade, bare copper cables were laid throughout. Supplies of electricity for operating the traction and other equipment on the railway are drawn from the mains of the City of London Electric Lighting Co. and the Charing Cross Electricity Supply Co., the point of entry in both cases being a sub-station adjoining the Post Office sub-station at King Edward Building. These supplies form part of the electricity purchased for general power and lighting purposes, and are three-phase, 50 cycle at 11,000 volts, which pressure is stepped down to 6,600 volts by a bank of three 1,000-kVA single-phase transformers with a total capacity of 3,000 kVA installed in the sub-station. The 6,600-volt side of these transformers is connected to duplicate bus-bars, change-over switchgear being provided, so that the supply may be taken from one or other of the two undertakings in alternate months; in case of breakdown, of course, the alternative supply is immediately available. The duplicate bus-bars in King Edward Building are connected to the Post Office sub-station at Mount Pleasant, where the bus-bars are in duplicate, by 0.1-sq. in. feeders in triplicate. A supply is also given from the King Edward Building sub-station through two 0.0225-sq. in. three-core cables to the railway sub-station at Liverpool Street, and from Mount Pleasant through two 0.06-sq. in. three-core cables to the railway sub-station at the Western Parcels Office. At Mount Pleasant the converting plant is accommodated in an existing sub-station; in other cases the traction equipment is placed in the invert of the large tube which forms the railway

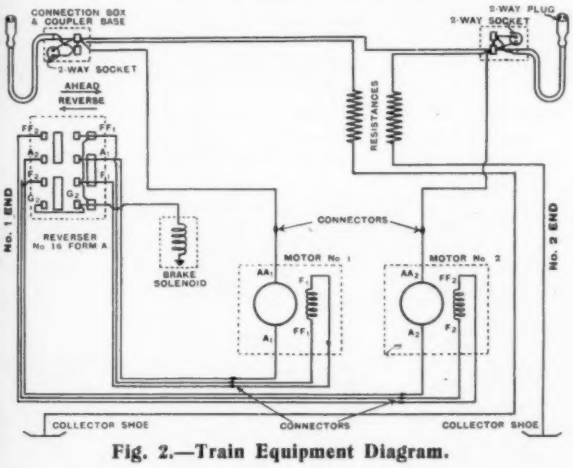


Fig. 2.—Train Equipment Diagram.

station. Feeders are protected by an overload circuit breaker at each end.

In each traction sub-station the 6,600-volt, three-phase supply is converted to direct current at 440 volts: a set of three 133-kW single-phase transformers forms a 400-kW bank, which is connected in delta on the e.h.p. side and in six-phase star on the low-voltage side; this bank is connected to a 400-kW rotary convertor, the combination of plant being provided in duplicate by the English Electric Co., Ltd. The rotaries are shunt-wound and are fitted with commutating poles and damping windings; they are self-synchronising, and a pony motor is used for starting. The negative side of the rotaries is earthed, but at the Mount Pleasant sub-station, which is above-ground, connection to the distribution board in the railway station is made on both poles. The equipment also includes two 30-kW motor-generators in the case of the large stations, and two 20-kW sets of similar design in the smaller stations, driven from the 440-volt direct-current supply, and generating direct current at 150 volts for the purpose described below; there are 16 of these sets in all, manufactured by Newton Bros. (Derby), Ltd.

The motors for operating the lifts, conveyors, ventilating plant, and the lighting circuits are energised also from the 440-volt bus-bars, either direct in the case of the stations where there are sub-stations, or through distribution switchboards. Finally, these two sets of bus-bars are connected through cables respectively to the 440-volt and 150-volt sections of a contactor rack, from which cables supply the different sections of the conductor rail in that railway station zone.

The rolling stock consists of steel motor wagons, which are made up into trains of two or three wagons, each wagon being capable of carrying a load of 1,120 lb. The electrical equipment of the wagons is simple, consisting principally of two 22-h.p., 440-volt, direct-current series motors connected permanently in parallel with a resistance in series with each motor, also permanently in circuit, and a set of electrically-operated braking equipment and reverser, as shown in fig. 2. The whole of the operation of the trains is automatic, starting and stopping control being effected from switch cabins at each station; no drivers are required. The wagon motors are energised in the ordinary way from the conductor rail, which is divided into sections, each section being controlled either by automatic track circuits on the sections between the stations, or by levers working under track-circuit control in the station areas; these levers are concentrated in the various switch cabins. To start the train, its proper route is set up, as described hereafter, and the conductor rail is energised at 440 volts, so that the train runs off down a falling gradient. The same pressure is employed on the conductor rails through the tunnel, the maximum speed reached being about 35 m.p.h. When a station is approached, the train enters a section on a rising gradient in which the conductor rail is dead, and is brought to rest by the automatic operation of the brakes. After a short interval the conductor rail in this section is energised at 440 volts, and remains energised at that voltage for a predetermined time, which is sufficiently long to give the train a good start. At the end of that period the voltage is reduced to 150 volts, and the train runs into the station at that pressure, where it either enters a dead platform section and is brought to rest by the brakes alongside the appropriate berth, or passes on to a through section, if it is not to stop at the station. Operation in and out of the sidings is effected at pressures of 440, 250, or 150 volts, depending upon the lay-out of the siding and its approach. All the sections which are normally dead are equipped with conductor rails, which can be energised in cases of emergency. Battery locomotives are also provided for maintenance purposes and the haulage of broken-down trains, arrangements being made for holding the wagon brakes off, so that they can be moved by hand for uncoupling purposes. A train passing through a station at which it is not scheduled to stop, does not require the continuous attention of the switchman, but its position in the tunnels and its destination are notified to that official by illuminated diagrams in the control cabin at the station. He is thus able to receive the train by pulling a lever, which sets the points for the appropriate route and energises the various controlled sections of the conductor rail. Generally, the method of controlling the station sections is based on the well-known "one-lever" railway signalling system of the Siemens and General Electric Signalling Co., Ltd., which sub-contracted to the English Electric Co., while the conductor rails in the tunnel sections are energised through contactors, which are operated by relays working on railway signalling principles. The methods by which this is done are very ingenious and somewhat as described below.

An illuminated track diagram in each control cabin shows which of the sections of the line that are under the control of that particular cabin are occupied by trains and also, by the extinguishing and lighting of lamps, the progress of each train as it enters and leaves the station. Communication between the adjacent control cabins in each direction is effected by means of an indicating board consisting of four panels, each of which is made up of a number of parallel strips: two panels are used for dealing with east-bound trains and two with the west-bound trains; the strips are lettered

in accordance with the proposed running of the different kinds of trains, *e.g.*, "All Stations," or "M.P." (*i.e.*, to Mount Pleasant only), and are provided with pilot lamps and press buttons. To the right and left of these centre panels are two others from which illuminated train describers on the platforms are operated.

Assuming that a train is ready to be loaded at the No. 1 berth of a station platform, by inserting a plug in the second of the jacks, a panel on the train describer (which is similar to that used on the London tube railways) is illuminated, so that the platform staff is informed for what station the train is to be loaded. When the train has been loaded, the foreman operates a switch on the platform, which lights a green pilot lamp over the appropriate panel in the control cabin and a red light on the platform indicator. The switchman then pulls the appropriate lever so as to set up the route and start the train, and extinguishes the platform describer and the green and red lights; he also lights two pilot lamps on the board at the next station eastward, and the signalman there, having thus received notification of the destination of the approaching train, sets its route accordingly. The appropriate lever in the control cabin sets the points for the particular berth at which the train is to be received, and energises the corresponding lengths of conductor rail. The lever is first pulled out a short distance to the track lock, where it is checked by a stop: this first movement puts the check lock in circuit, and energises the coil of the latter through a circuit which passes through all the track circuit relays of the route over which the train has to travel. If these sections are clear, the check lock is lifted, and the lever can then be pulled forward to its fourth position (the third position is used on the return movement of the position lever), known as the point lock, thus operating relays that start all the point motors which have to be moved to set up the required route. On the completion of this operation the check lock is connected to detecting contacts on the point blade, the closing of which causes a current to flow through the check lock, so that it is released, and the lever can then be pulled into its final position. In this position, assuming that the tracks are clear, the control circuits of all the appropriate point contactors are closed, thus switching current on to the conductor rail.

When the train has arrived in its berth, the lever can be replaced by stages: the first inward movement cuts the current off the conductor rail (an operation which, it may be added, can always be performed even when the train is running or fouling the points); in the second backward position all the track relays are put into the check-lock position and, finally, if the tracks are clear and contactors open, the lever can be moved into the third position, thus causing any points which have been moved to be restored to their normal settings. It may be added that there is complete mechanical interlocking between the levers dealing with conflicting routes. When it is necessary to move a train from one berth to another at the same station, the final motion of the lever energises the conductor rail as before, but connection is now made to the 150-volt instead of to the 440-volt supply. If, on the other hand, a route is set up from a platform section to one of the through sections, loops, or sidings, the conductor rail in the former section is energised at the full 440 volts, so that the train can be run off under full power.

So that emergency movements with a battery locomotive can be effected, two so-called king levers control the west- and east-bound sections of the track respectively, and make all the conductor rails on that particular side of the railway and under the control of the particular cabin, dead, but do not cut out the point motor circuits, which can still be operated by their respective levers. The operation of the king lever in certain cases also frees a key, which can be used for unlocking the point lever at the entrance to the siding, so that the battery locomotive which normally stands there can be brought out; this operation can, therefore, not be carried out unless the conductor rail is dead. In addition, four switches operated by Yale keys are provided in each control cabin, so that certain sections of the main-line track can be made dead for inspection. Facing points are motor-operated in both directions, trailing points being free. The motors are contained in cast-iron boxes, and have two series fields, one of which is used when running in each direction, and at the end of its run each motor is set for the return stroke by contact arms, while a clutch is provided in the centre wheel of the gearing, which slips if there is any obstruction in the points. The motors operate on the 150-volt circuit, and have a normal rating of about 1/10 h.p. at 1,000 r.p.m.; generally, they do not make more than 38 revolutions at a time.

The operation of the track circuiting system by means of which current is supplied to the conductor rails in the tunnel sections may be explained as follows:— When a train enters the first automatically-operated section A, it causes track relay A to be picked up and open-circuit stick relay AS, which drops; the train passes on to section B, stick relay BS being dropped in a similar manner. Track relay A drops as soon as the train leaves section A; with track relay A down, track relay B up, and stick relay BS down, the AS stick relay is reset, provided that the power contactor supplying section A is open. The power contactor for section A will not be closed until stick relay BS has been reset by the train running on to section C. If a train runs on to a particular track without operating it for any cause, the stick relay of the section behind will not reset, thus providing protection for the train ahead. As the train approaches a station, it runs off the last automatic section on to a braking section on a rising gradient, so that the brakes are assisted by gravity in bringing the train to rest, the length of this section being sufficient to ensure that this happens under all conditions. When at rest in the braking section, the control of the train is assumed by camshaft gear of a pattern very similar to the equipment used on the English Electric Company's electric locomotives. The camshaft spindle is driven by a pilot motor through reduction gear, and operates three contactors whose sequence of operation is thus determined by the setting of the former. The three cams being fixed on the spindle, the time during which any contactor remains closed depends on the speed of the camshaft motor, which can be varied by means of control resistances both in series and in parallel with the armature. The field is continuously energised, and one side of the armature is earthed, the other being connected to the moving contact of the motor relay; the upper contact of this relay is connected to the supply circuit, the lower being earthed. Accordingly, when the relay solenoid is energised, current is supplied to the motor, and the camshaft is rotated. When the solenoid is de-energised, the armature is short-circuited under full field, thus providing a powerful braking effect. This solenoid is fed through the contacts of the various track-circuit relays of the route concerned, and the fingers and segments on the position regulator. When certain of the fingers become energised, the camshaft rotates so long as these fingers are in contact with their corresponding segments. The complete rotation of the camshaft can be divided into four complete zones: (1) braking time, during which the train runs into the section and comes to rest; (2) and (3) power zones, during which the conductor rail is energised at 440 and 150 volts respectively; and (4) off zone, during which it is running on to its starting position. A complete cycle of operation is performed each time the camshaft rotates through 180 deg., and rotation from the starting position commences when a train enters the braking section and proceeds either continuously, or by stages, according to the position of the train. When the train has come to rest, the camshaft energises the conductor rail at 440 volts for five seconds, causing the train to start again; at the end of that period the camshaft reduces the pressure on the conductor rail to 150 volts, under which pressure the train runs into the station.

(To be concluded.)

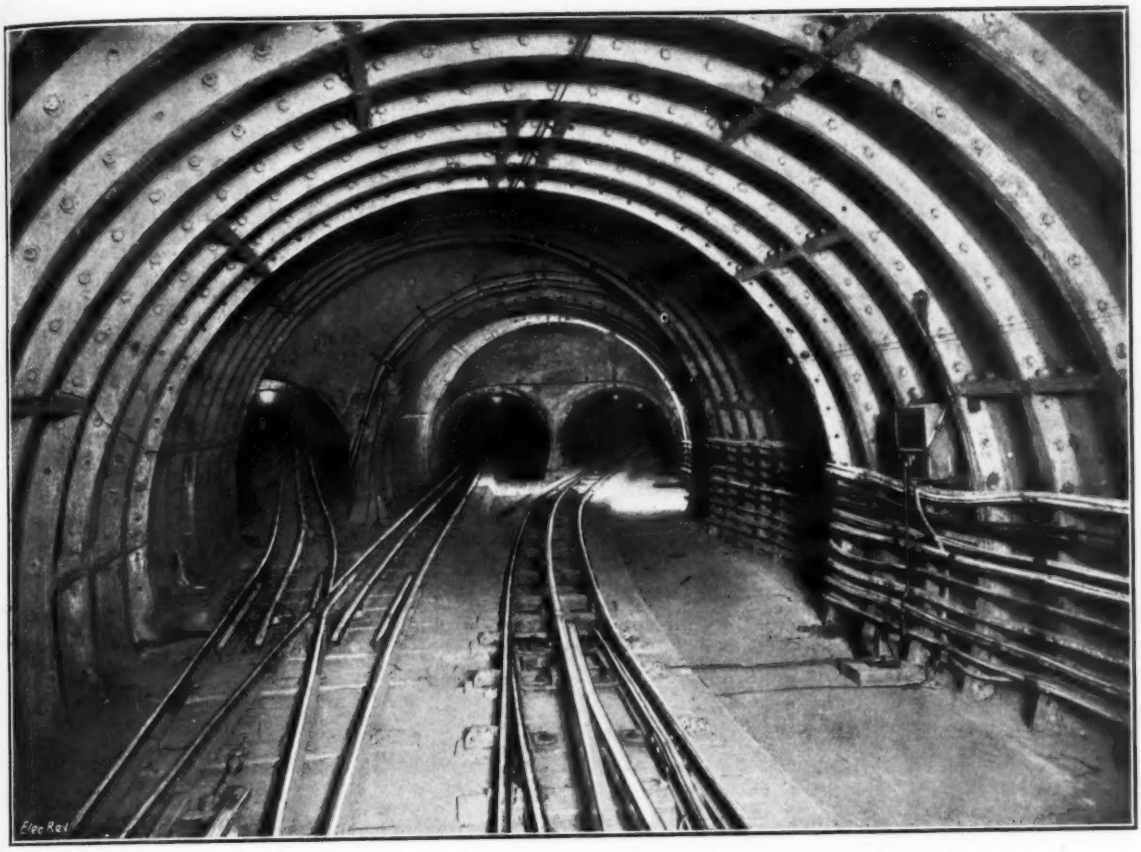


Fig. 3.—Tunnel Interior, showing Car-shed Line, Main Line, and Mount Pleasant Siding, left to right.

Fig. 4.—Post Office Railway : View of Double Track in 9-ft. Diameter Running Tunnel.

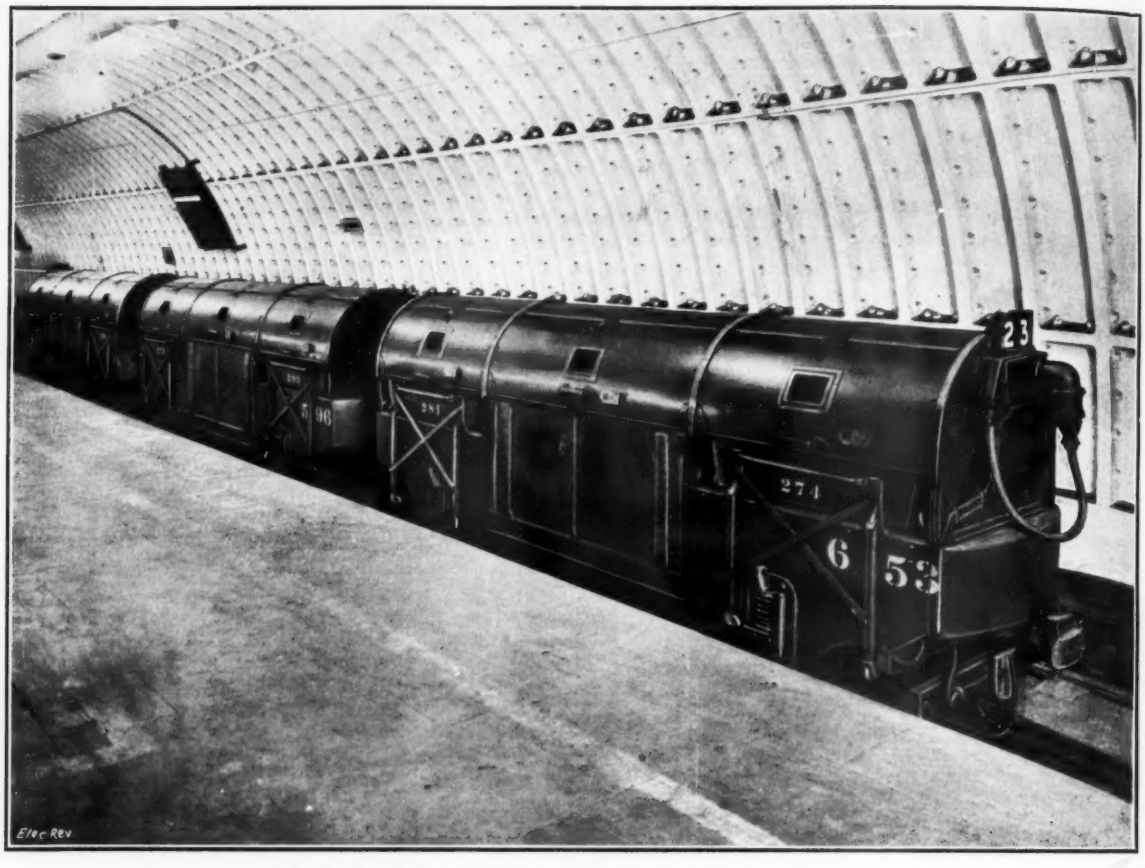


Fig. 5.—Electric Mail Train at Rest Alongside Station Platform.

Fig. 6.—Post Office Railway: View of Train being Loaded with Mail at Underground Station.

The Dehydration of A.C. Motors.

Some Experiences of the Flood of January 7th, and the adaptability of the "Inductastat."

By W. E. ROGERS, A.M.I.E.E.

SINCE its inception, impregnation of the windings of motors has been the standard practice of most manufacturers. They commenced by applying a varnish of the shellac variety to the coil windings with a paint brush, after which they proceeded to the stove or baking process in an oven. The next step consisted in the total immersion of a warm wound element in a bath of insulating varnish, prior to stoving, and more recently vacuum drying has been resorted to, before impregnation. Opinions differ with regard to the value of vacuum drying, and the writer attaches little practical value to the process, though it may be useful as a salesman's talking point. Impregnation under pressure, however, seems to be more efficacious and of practical value, whilst the Machines Auxiliaires et Electriques Industrielles of Paris and Arras (the title of which is abbreviated to M.A.X.E.I.), which is represented in London, in conjunction with the French Thomson-Houston Company, appears to be making good progress with a special bakelite varnish; it is claimed that a machine so impregnated can run submerged in water at a temperature of 300 deg. C., without detriment to the windings. This claim is made, of course, without recommending anyone to run a motor at 300 deg. C., which for obvious reasons is impossible. However, during the early hours of January 7th, 1928, Father Thames, ignoring all B.S. specifications, impregnated with water a large number of the motors situated at the hub of the South-East England Electricity Scheme's area as defined by the Central Electricity Board. Quite a number of drowned motors passed through the author's hands for restorative purposes, and a host of unusual defects were brought to light and had to be cleared promptly under most unusual pressure of circumstances. A large number of "closed-rotor" motors conformed originally to the manufacturers' efforts to effect the cheapening of production, and the stators were wound with the standard former-wound type of drop-in coils, corresponding to what the "shop" knows as "basket windings," with hemitropic coils, which produced a finished symmetrical winding, beautiful to look at, but the despair of repair men, as the failure of one coil in one phase generally involves the complete rewinding of the stator concerned. The type of coil referred to also implies open or partially open core slots, which, with the final slot wedges omitted, gives a very slack individual coil fit; the drying-out of water from a wedge-closed slot is a very tedious process. The aforesaid type of winding compares, from the repair man's point of view, most unfavourably with the individual or pulled-through type of coil. Again, on giving a final run-up test prior to reinstallation, due to the heavy initial current, quite a number of "basket-wound" machines went dead to earth, generally due to the severe mechanical shock applied, causing momentary distortion of the coil-ends. The foregoing type of failure did not apply to anything like the same extent with the tightly-pulled-through type of coil, with its closely taped protruding ends. Further, a "basket winding," with its more or less open slots, from the manufacturers' point of view, frequently enables the winder to adopt any desirable cross-sectional area for individual coil conductors for varying horse-power requirements applicable to any particular frame size. The former-wound type of coil, consisting of two or three conductors in parallel per coil per phase, because of the initial current rush, frequently caused the fracture of one conductor in a multiple-conductor coil. In one particular case of a flood rush dry-out job, this occurred, and a final short run-up prior to reinstallation did not disclose any incipient trouble; but within 24 hours of a load run, one stator coil burnt out owing to its reduced carrying capacity, with consequential damage to adjacent coils of another phase. Such a failure is impossible with a single-conductor pulled-through type of coil.

Lucky indeed was the man who happened to have the most recent type of "closed rotor" motor starter in his possession—namely, an "Inductastat," as marketed by Messrs. Vlasto, Clarke & Watson, of Stockton Heath, Lancs. This device, though it was not designed to deal with flood problems, proved very useful, not only due to its double-automatic design and gravity "fool-proof" potentialities, but because of its variety of optional taps or tappings, efficient control of initial current, and very gentle application of voltage and current to any appropriate motor stator. A geared slow-motion external operating wheel governs the withdrawal of the choke cores from their respective phase solenoids, and there is a total absence of "juddering" (*i.e.*, the motor cyclists' condensate of jumping, shuddering and chattering). For normal requirements, the "Inductastat" is equipped with a very sensitive type of single-motion, pendulum-type no-voltage release attached to the adjustable damped overload trips, one in each phase conductor. Facilities are also provided in the apparatus for enabling any class of wire or screwed conduit to be employed to connect incoming and outgoing cables to the easily accessible main terminals which are situated at the upper end of the starter. This wall-fixing type of infinitely variable auto-transformer starter is a robust and handily designed apparatus, incorporating as it does a good type of renewable-contact drum controller, and generally complying with the Home Office requirements and the appropriate B.S.S. No. 141 of 1922. Whilst the old single-phase slip-ring motor may be an obsolescent device, for many years to come this type of motor will exist, and it

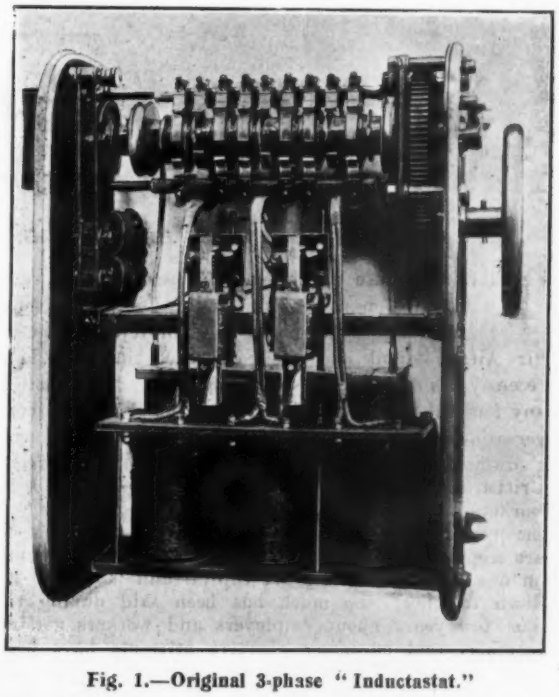


Fig. 1.—Original 3-phase "Inductastat."

is a comparatively simple matter to design an "inductastat" with only one infinitely adjustable choke coil for the single-phase stator and a three-phase star-connected rotor resistance for the moving member. An adjustable resistance for the appropriate phase-splitting section of a stator design is well within the field of practical design, and will successfully meet the requirements of the maintenance and operating engineer. But this design has not yet been commercially developed, although preliminaries are well in hand. It will readily be appreciated that an "Inductastat" can be so designed that the choke coils cater for the requirements of quite a small motor, whilst being equally suitable for a comparatively large machine. Hence, in a works where spares are retained, a stand-by "Inductastat" may serve as a stand-by to quite a large number of individual motors. Thus what may be considered as a "stand-by" or "insurance" cost is kept down to the absolute minimum. The foregoing illustration, fig. 1, indicates the general appearance of the first commercial "Inductastat" manufactured for a three-phase problem, but it does not show the five-tappings-per-phase choke coil now adopted as general practice for varying conditions; the outline diagram, fig. 2, shows the actual connections for a 20-h.p., two-phase, three-wire "Inductastat" which the author has personally tested.

Finally, it should be said that the writer's interest in the patented device described herein is purely confined to the technical and practical side, as he has absolutely no connection whatever with the makers of the apparatus referred to.

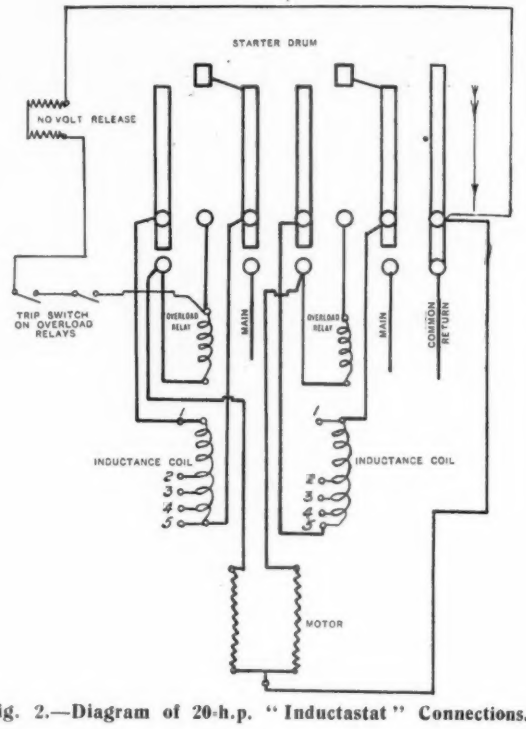


Fig. 2.—Diagram of 20-h.p. "Inductastat" Connections.

Thoughts on Industrial Peace.

The author reviews some of the matters which will occupy the attention of the Mond Conference.

By J. W. THOMAS, LL.B., A.M.I.E.E.

THE acceptance by the General Council of the Trade Union Congress of the invitation issued some weeks ago by a group of employers headed by Sir Alfred Mond and the conference that was held recently has naturally set many wondering as to whether any fruitful results are likely to accrue from these conversations. On the face of it there is no reason why a discussion of the broad problems which confront British industry should not be of great benefit to both workers and employers, to say nothing of industry and the public at large. Nevertheless, there are some who are sceptical and others who look with grave misgiving on one more attempt to get capital and labour to lie down together. So much has been said during the past few years about employers and workers getting together, and so many abortive attempts have been made to persuade them to do so, that there is naturally a certain amount of suspicion regarding the present proposal. Employers complain, on the one hand, that they have encountered on previous occasions the rigid inflexibility of the workers against any changes in workshop routine and in trade union practices; and the trade unions, on the other, retort that they have found to their cost that the employers' approaches towards industrial peace have been merely camouflage for an attack upon the standard of life of the workers. There has been such an atmosphere of disgust generated by these fruitless attempts in the past that, in the opinion of many, no amount of discussion will be powerful enough to dissipate it. Furthermore, it is argued by some that the men on whose behalf an invitation has been extended have no mandate to speak for the employers as a whole and that their invitation has not received the approval of either the National Confederation of Employers' Organisations or the Engineering Employers' Federation, both these bodies having previously insisted that industrial peace must be sought separately in each industry.

Whilst this is undoubtedly true, most people will agree that Sir Alfred Mond has done the next best thing and he can claim to have organised a representative body of men who will have no difficulty in speaking with the greatest authority for many industries with which they are connected.

But notwithstanding scepticism and criticism the public at large will welcome the suggested conferences. In the first place, British industry is admittedly in a bad way, and some hard thinking will have to be done and many cherished prejudices will have to be discarded before it is put right. There are few industries in the country in which industrial relations are passably satisfactory and this state of affairs furnishes the best of reasons for a determined attempt to improve them. Moreover, there are certain points on which all parties are agreed, *viz*:—that there must be more co-operation between employers and workers, the evil inheritance of distrust must be eradicated, a halt must be called to active hostilities, and the general productive efficiency of industry must be improved. No one will question the desirability of these things and only a representative conference can suggest how they can best be secured. It will not be satisfactory to deal with each industry separately, as so many of our pressing difficulties are general and must be considered on a national basis. Separate industries can be tackled later when the general principles have been settled.

Nor will it be of any use to talk platitudes as so many politicians and after-dinner speakers have been disposed to do of late. We are glad to see that Sir Alfred Mond and his colleagues have recognised this and have expressed their anxiety to come down to what they call definite and concrete proposals applicable to, and to be determined by, the various industries con-

cerned. It is not likely, of course, that the conferences will produce any startling or cut-and-dried scheme, but they can lay down certain guiding principles for detailed application in the various industries and can encourage the belief that they are not only desirable but practicable.

The first and most important task, however, should be to generate the right atmosphere. This may sound dangerously like a platitude but it is none the less fundamental. It was the absence of a favourable atmosphere which made a solution of the miner's problem hopeless. Co-operation will be impossible and progress will be stultified unless the right attitude is displayed by both sides. The assumption of inevitable conflict, which so often has been at the basis of discussions, must be undermined and exploded. Instead of regarding themselves as antagonists, employers and workers must come to look upon each other as partners in a joint enterprise, so that the notion of co-operation, instead of being distasteful, will be welcome. There must be a readiness to understand each other's point of view and a willingness to sacrifice antiquated beliefs, no matter how fondly cherished in the past. In short, there must be a genuine desire to co-operate. No one can have had any dealings with workmen without realising the immense difference in output which results when there is genuine co-operation and a real desire to work together. A real co-operative relationship between workers and employers would in every industry do a great deal both to eliminate the minor causes of industrial friction and actually to improve the processes of production. But if employers are to reap the full rewards of co-operation it is essential that they should seek to work with the grain of the trade union movement. If the trade unions can be enlisted on the side of a concrete attempt to improve industrial efficiency, there is a real chance that big results may follow. The trade unions can be powerful instruments if they are utilised properly and their general attitude towards any proposals will have a determining effect on their success. Whether, as the Secretary of the Trade Union Congress has stated, they resist any attempts to increase industrial efficiency or adopt a passive attitude towards them or decide actively to participate in a concrete effort to increase production by the development of the most scientific methods so as to provide for a rising standard of life, will depend upon the confidence which is reposed in them and the extent to which they are treated as real partners in industry.

They must in the first place be treated as partners and not like a pack of children who can be cajoled or frightened into obedience. They must also be given some guarantees that they will share in the gains which result from increased productivity. As long as the workers are allowed to remain under the impression that they have little to gain either materially or in status by the introduction of new methods which are designed to promote greater efficiency, but on the contrary, that they may suffer by their adoption, progress towards co-operation is rendered exceedingly difficult. When the employers have offered these guarantees they will be in a position to demand that the trade unions should deal with the allegations which are made against them regarding ca' canny, lines of demarcation and antiquated trade union customs, and they will have a right to ask the trade unions to put their own houses in order.

There must also be a frank disclosure of essential facts relating to industry, and the workers must be assured that their own well-being is given a proper place among the industrial aims of the employers. If the co-operation of the workers is desired, they must be looked upon as co-operators, and this implies that they must be treated as such when industrial policy is being determined and that no decision affecting their day-to-day life will be made before it has been fully discussed with them through their chosen representatives. By these means the workers will learn that industry can only afford to improve their lot if it is functioning profitably. The case for publicity is overwhelming. If you want people to work together, surely the first thing is to tell them what it is all about, what the problem is, and how you are seeking to tackle it, and from time to time tell them what progress is being made. This means that managerial questions which hitherto have been outside the realm of industrial discussion must be brought within it.

The time is ripe for an extension of the democratic idea in industry and for the granting to the organised workers of a definite voice not only in regard to workshop conditions but in connection with the larger questions of policy. Industry is in course of evolution towards more democratic forms, and the employers, if they are wise, will recognise this and try to shape their plans accordingly, and not seek to stem the flowing tide but harness its energies for the good of themselves, the workers and the community. It will no doubt be necessary to start carefully and move slowly, but a beginning must be made if there is to be the effective and cheerful co-operation that both enlightened employers and moderate trade unionists profess to want. Careful investigation ought also to be made in regard to the desirability of making greater use of the Industrial Council machinery. Whatever the critics may say to the contrary, it is now hardly open to question that in those industries where Whitley Councils have been instituted they have proved a most effective means of preserving peace, of promoting amicable settlements of differences and of enabling the workers to have a voice, if only a small one, in the affairs of the industry. Admittedly they have not achieved all that was hoped from them, but there are solid gains to be placed to their account, and it is not without significance, as Professor Clay has pointed out, that it is in those industries where they have been maintained that there has been the greatest absence of industrial strife. That in itself is ample justification for a consideration of their application to other industries.

Finally, a great deal requires to be done in the direction of the extension of scientific management. Little need be said, however, under this head, as it is almost certain the employers will make this one of the principal topics of discussion. There should be no difficulty in removing the suspicions of the workers if the employers are genuine in their proposals and undertake that the workers will profit and not lose by the increased production that results.

Singapore Floating Dock.

The Singapore floating dock, which has been built by Messrs. Swan, Hunter & Wigham Richardson, is the largest in the world, and is entirely electrically equipped with Crompton-Parkinson plant for the vital pumping installations. The dock has a capacity of 50,000 tons, and has been built for the British Admiralty in the record time of 11 months; the rapidity of this erection will be appreciated when it is stated that it contains no less than 20,000 tons of steel, 3,500,000 rivets, and had to be built in seven separate sections. Three 3-phase, vertical-spindle motors of over 300 h.p., 1,000 volts, 50 cycles, 480 r.p.m.; two of over 90 h.p. at 960 r.p.m., and two of 180 h.p., 1,000 volts, 50 cycles, 575 r.p.m. have been installed to drive the pumps; they are based on 60 deg. F. temperature rise, and are similar in construction to those manufactured by the company for the floating dock constructed about five years ago for Southampton. The machines were designed to withstand the worst conditions prevailing in the tropics, and they may be unemployed for long periods, when the dock is not in use. Other Crompton-Parkinson motor-driven plant on the dock includes the fire and wash-down pumps, capstans, sideshores, &c.; the latter, of which there are four, are for ensuring that the ship is floating centrally in the dock before the water is pumped out and the dock raised to take the weight of the ship. Special precautions were taken on account of the possibility of stalling the motors, which may frequently occur when centring the ship in the dock.

Our Overseas Electrical Markets.

Trend of import trade of Australia, New Zealand, India, and South Africa. Factors affecting purchasing power.

SINCE our last quarterly review of the course of trade in Great Britain's chief electrical markets, *viz.*, Australia, New Zealand, India and South Africa, the general tendencies of those countries as buyers of British goods have not altered greatly.

From the accompanying charts it will be seen that Australian imports of electrical material generally have been fairly steadily maintained, while Great Britain's share in supplying India's steady requirements of machinery and apparatus has remained well up to recent levels. With regard to New Zealand, the imports of electrical machinery and equipment into that important market fell in October after attaining over £200,000 in value in August. South African imports of electrical machinery have also dropped considerably from their high level of January last year.

Australia.

Hopes of a revival of trade in Australia are based mainly on the slightly better prospects for wool and wheat. Competition at the wool sales at Melbourne and Sydney as well as in London has been keen and good prices have been realised. As to grain, the worst effects of the drought have been countered to a large extent by more favourable subsequent weather, and it is now

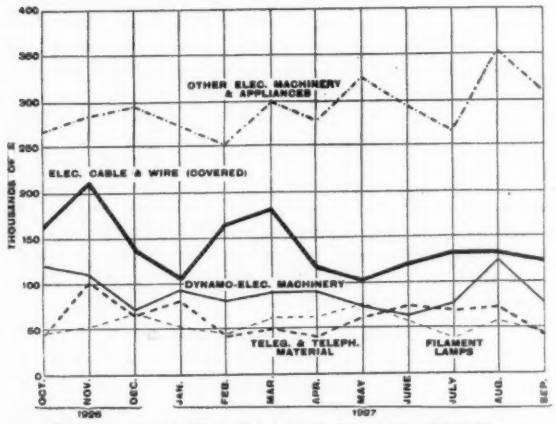


Fig. 1.—Australian Electrical Imports, 1926-27.

believed that the harvest will yield better results than were at one time expected. Yet in the opinion of some authorities wool and wheat will be £20,000,000 below last season in value. The effect of the drought upon the crops caused an increase of unemployment in most States of the Commonwealth. In New South Wales this was accentuated by the interruption of operations at coal mines and steel works.

A favourable feature at the close of the year was the satisfactory rainfall in most districts. Although in South Australia drought affected both wheat and pasture, while in Queensland it also affected the back country, there were welcome rains in the coastal belts of Queensland and a good but rather belated fall in Victoria and New South Wales, where the wheat harvest will undoubtedly be considerably below the normal. A good crop, however, is expected in Western Australia, but it must not be supposed that the purchasing power of the Commonwealth will be other than adversely affected for some time to come.

Rather a strong light has recently been thrown on the effect of the policy of the Australian Government in endeavouring to foster industries of doubtful economic suitability to the country by means of excessive tariff protection. It has been shown that such a policy leads to dearer living accompanied by demands for wage increases and, in due course, to requests for still higher import duties with a view to making up for the greater cost of manufacture. Meanwhile, British makers undoubtedly have better prospects than any others of being chosen to supply the large quantities and varieties of machinery and material that have still to be imported. One of the more recent developments of an electrical nature lies in the production of lighting fittings—not a highly technical affair. But motors, switchgear, resistances, batteries, accumulators and wattmeters are also made.

Legislation has been introduced for providing a fund of £20,000,000 for building purposes. Money would be advanced for the erection not only of warehouses or storage facilities for primary products, but also of plant for their preservation and marketing.

As a result of the criticism of excessive state expenditure, it is not now intended to proceed at once with the programme of telegraph and telephone extensions, but to spread the work over several years.

New Zealand.

In New Zealand, although the labour market has improved, the Government still finds it necessary to prolong the restriction of assisted immigration until June. Meanwhile, it is expected that the state of employment will return to normal, as not only is there a healthy demand for agricultural workers, but factories also are absorbing more hands. Good weather and greater stability in the prices of New Zealand produce have helped the fairly general recovery in trade. The statistics of the foreign trade of the Dominion for last year reveal a much more favourable position than in 1926. Exports totalled £48,496,000 in value and imports £44,783,000, showing an excess of exports of nearly £5,000,000. Bank deposits, at £47,615,000 on Septem-

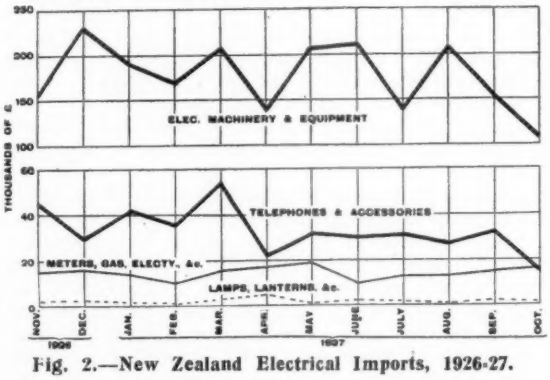


Fig. 2.—New Zealand Electrical Imports, 1926-27.

ber 30th last, though lower than at Lady Day or midsummer, were £1,000,000 higher than at the end of 1926.

A record export of dairy produce is anticipated this year, while wool production is expected to be in excess of last season. These two industries, together with the third most important activity in the Dominion, *viz.*, meat, are on a more promising level than for some years. Thus occupations which account for 90 per cent. of New Zealand's export surplus are in a condition that justifies every confidence in the purchasing capacity of the country. The New Zealand railways are still in the market for quantities of materials of interest to British manufacturers.

India.

In India there are many indications that the export surplus of produce during the coming season will be well up to the average and very probably above it

The cotton yield is expected to show an advance of 500,000 bales on the previous crop. Tea production and sales have been fairly satisfactory, while the jute and oilseed situation is also favourable. The consequent maintenance and very probable improvement in the general economic position will aid the purchasing capacity of the country and bring to fruition the many electrical schemes that are mooted.

An expansion of the demand for lighting material, fans, &c., should result from the town-planning schemes along the route of the newly electrified suburban service of the Bombay, Baroda and Central India Railway. There are excellent prospects too for an increasing electrical market in the Punjab and neighbouring States, where a start has been made in developing the water power in the Himalayan foothills. Exporters might well keep an eye on the possibility of cultivating fresh openings in Lahore, Amritsar, Lyallpur, Ferozepur, Jullunder, Kapurthala, Kangra, &c. Similarly fresh electrical markets will be developed in Madras as a result of the scheme for supplying power to Coimbatore,

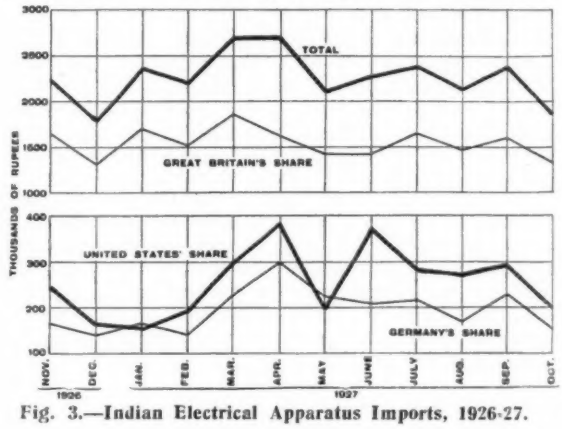


Fig. 3.—Indian Electrical Apparatus Imports, 1926-27.

Pollachi, Dindigul, Trichinopoly and Madura from a central station near Masinigudi. For a start three 7,500-kW sets will be installed and, later, two will be added.

The increasing utilisation of electrical appliances by the coal mines is the subject of comment by the Chief Inspector of Mines.

The conclusion arrived at in the light of long experience and careful investigation by Mr. Ainscough, H.M. Trade Commissioner (whose report was reviewed in our issue of January 20th) is that British firms can

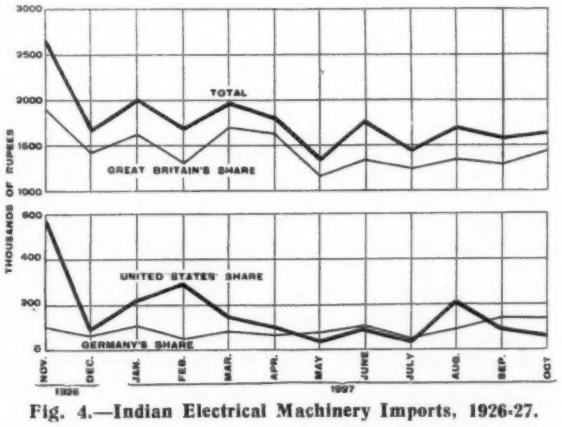


Fig. 4.—Indian Electrical Machinery Imports, 1926-27.

continue to secure the preponderating share of Indian business if their prices are attractive and they will give efficient service on the spot. While it is satisfactory that British manufacturers have been able to hold their own against such formidable competition as the German and American groups, and it is gratifying to learn of the splendid service given by the branches and agencies in India of the leading British electrical concerns, it must not be overlooked that competition is very keen. When one considers the meagre dividends paid by some of the electrical manufacturing concerns at home, it is scarcely surprising to learn that orders for power plants are taken at prices which show little if any profit.

South Africa.

Christmas trade in Cape Town showed an improvement on that of twelve months previously. In most districts of the Union—except those affected by drought—the New Year opened with a fairly confident feeling, engendered largely by the welcome advent of rain over almost the whole of the Union, which set in a little before Christmas. When the complete statistics of the Union's foreign trade for 1927 are known, it is expected that a favourable balance of about £8,000,000 will be revealed, imports totalling in value about £1,000,000 less than in 1926 and exports approximately £7,000,000

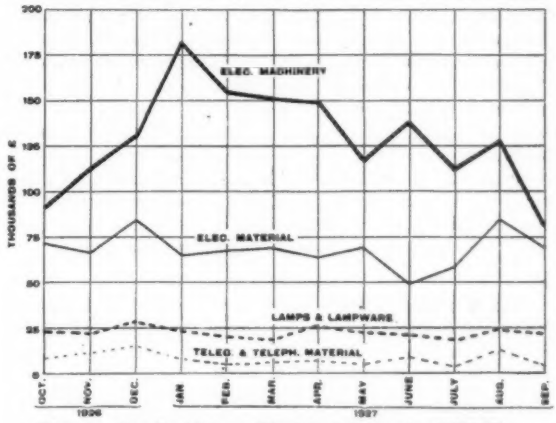


Fig. 5.—South African Electrical Imports, 1926-27.

more. Railway earnings have been considerably above the estimates, the total during the first nine months of the financial year being more than £250,000 to the good. The fact that the 1927 gold output of the Transvaal mines exceeded even the record figure of 1926, is a point in favour of trade prosperity.

The maize crop is estimated at 60 per cent. at least larger than during the previous season, with an export surplus of over 7,000,000 bags, a general improvement in the condition being reported at the middle of January.

The Development of the St. Lawrence.

The Joint Board of Engineers (American and Canadian) appointed to consider the problems connected with the development of the St. Lawrence, for navigational and hydro-electric purposes, has issued a voluminous report. A report submitted to the International Joint Commission in 1921, is first dealt with. This showed that the development of nearly all the potential power (about 4,000,000 h.p.) could form a co-ordinate part of the schemes for the improvement of navigation. The simultaneous development of the power was, however, not considered economical owing to the lack of a market for it. The present report states that sound business management will dictate the initial installation of only a part of the hydro-electric plant. With a total initial installation of 1,368,000 h.p., the costs, including all features required for navigation, and with complete channel enlargement for winter power operation, would be respectively $350,000,000 and $385,500,000. The plans presented by the Board outline the subsequent complete development of the river by the construction of additional power works, with an installed capacity of about 2,500,000 h.p., at an additional cost of approximately $225,000,000. The total ultimate development visualised by the Board, therefore, amounts to about 5 million h.p., at a total cost of from $620 to $650 millions, including navigation works. It is considered that it will be necessary for the Governments to supervise the operation of power works to prevent the river water levels being seriously affected.

Line and Transformer Insulation.

The author discusses the important question of the co-ordination of the breakdown or flash-over strengths of transmission-line insulators and transformer bushings and windings.

By H. S. HOLBROOK, B.Sc., A.M.I.E.E.

THE most severe stresses to which electric transmission systems are subjected are those caused by the over-voltages resulting from lightning storms. These pressures are usually of high magnitude and very brief duration. For such momentary impulses the flash-over strengths of insulators and bushings, and the breakdown strengths of transformer insulation are much higher than when tested at power frequency. It follows that if the commercial tests for the various parts are to be made at power frequency (usually 50 cycles), they should be set at such values as would secure the required strength for each part to resist the stresses arising from lightning storms. In order to protect transformers against destruction or damage which would result in interruptions to the supply service, the lightning strength of the transformer windings should be somewhat higher than that of the line insulators nearest the station.

Line Insulators.

The highest voltages which occur on transmission lines being due to lightning-storm impulses, which are highly damped, the line insulation, a mile and further from the transformers, may have considerably greater values than at points adjacent to the transformers, without increasing the stresses on the latter. It is sometimes desired to insulate the line additionally and not increase the insulation (and therefore cost) of the transformers correspondingly. In such cases the strings of line insulators immediately adjacent to the transformers should be shorter than at other points. Practically equal line performance can be obtained everywhere by using over the " adjacent mile " of reduced line insulation additional overhead ground wires, as compared with the remainder of this line.

Transformer Bushings.

It is desirable that transformer bushings should be slightly stronger than the adjacent line insulators, so that flash-over would occur on the line insulators rather than on the bushings. This is because an arc spreads so rapidly that if it occurred on a transformer bushing it would be liable to cause line short-circuits and damage the tank or bushings, thus putting the transformer out of commission, whereas, if the flash-over occurred in a tower structure over arcing rings, experience has shown that no damage would be likely to result.

Transformer Windings.

The transformer windings should, of course, have higher impulse strengths than the bushings, so that a flash-over at the transformer would occur through the air rather than through the winding insulation. The bushing, for reasons noted above, should not be considered as the " over-voltage protection," but only as the last line of defence when all other protection to the windings has failed. Quite a small margin between the impulse strength of the adjacent-line insulators and the windings should be sufficient if there is immediately adjacent to the transformers apparatus such as lightning arresters to supress over-voltages. If there are no lightning arresters, or they are a little distance away, the windings may be called upon to withstand repeated shocks only a little below the flash-over value of the adjacent-line insulators. This necessitates determining for the transformer insulation the ratio of the strength to resist repeated shocks to the breakdown strength under a single impulse.

Tests.

The relative strengths of the line insulators, bushings and transformer windings should, of course, be determined for those conditions which give the highest stresses in service, *viz.*, under impulse voltages. The relative 50-cycle strengths may be quite different. All commercial testing should be at 50 cycles, as it is not possible to make a transient test on a winding and determine its effect without continuing the test to destruction. The British Thomson-Houston Co., Ltd., and its associated companies, have conducted extended investigations, both experimental and theoretical, into the relation for different insulations between impulse strengths and tests at 50 cycles. The following notes are a summary of part of the data obtained :—

The majority of the tests were made by Mr. F. W. Peek, Junr., in the high-voltage laboratory of the General Electric Co., of America, at its transformer factory at Pittsfield, Mass., U.S.A., using the " impulse generator " constructed in 1912. Klydonograph measurements of the voltage at which line insulation on actual transmission lines flashed over during the 1926 lightning season gave results almost absolutely identical with the figures obtained in the laboratory tests with a particular impulse wave, showing that for all practical purposes the laboratory-producel impulse with this wave form gives the same results as lightning stresses in service. It was found that the impulse strength of line insulators and bushings was the same when wet as when dry. The ratio of the instantaneous value at the impulse breakdown point to the r.m.s. value of the 50-cycle dry arc over was found to be, for a plain string of line insulators, 2.5, and for the outdoor bushings tested, 3.25.

A ratio was also determined on actual transformer windings for the ratio of the impulse strength to the 50-cycle one-minute ultimate strength. The latter is, of course, always greater than the 50-cycle one-minute test. The excess is naturally not constant, being a much larger percentage on low-voltage transformers than on those for higher voltages. Consequently, it is impossible to give one figure applicable to all transformers. For the type of transformer tested, the ratio of single-impulee breakdown value to the 50-cycle one-minute (r.m.s.) test was :—

6.4	when designed for a test of				50 KV
5.2	,,	,,	,,	,,	100 KV
4.9	,,	,,	,,	,,	200 KV
4.8	,,	,,	,,	,,	400 KV

When graded insulation is used on the transformer it is, of course, the 50 cycle insulation test on the line end which should be compared with the 50-cycle dry flash-over of the adjacent line insulators. The strength to withstand repeated impulses was found—on these particular constructions—to be 80 per cent. of the single impulse strength. If, therefore, there are no suitable lightning arresters installed immediately adjacent to the transformers, the impulse flash-over value of the adjacent " short string " of line insulators should not exceed about 75 per cent. of the single impulse strength of the transformer.

In applying these ratios to an actual transmission scheme one could start either at the transformer windings or the line insulators. Experience shows that the standard one-minute 50-cycle tests of B.S.S.171 are adequate if the line is not—by comparison—over insulated. The line insulation needed depends not only on the working voltage, but is also a function of the height of the line, the arrangement of ground wires and of the topography of the country through which the line passes.

Bearing Temperature as an Index to Condition.

By observing the temperature of ring-oiled bearings, incipient trouble can be detected.

By H. WILLIAMSON, A.M.I.Mech.E.

THE bearings of modern large motors are so well designed and so carefully made that there is a tendency to assume that they will run indefinitely, and to overlook their simple needs.

Even with the best ring-oiled bearings it is an obvious precaution to ascertain, before starting the motor, that there is oil in the bearings and, when the motor is running, that all the rings are doing their duty. If these precautions have been taken, there is no danger of any sudden development of trouble, and that which develops slowly can be guarded against, provided that its gradual onset has been detected.

As with human beings, the temperature of a bearing is a good indication of its condition, and it is wise to establish, and record, a normal temperature rise for each bearing. A mercurial thermometer will answer the purpose quite well, but it should have a loose index in the tube so that the maximum temperature reached during the day's run can be recorded. Strange as it may appear, a straight thermometer with narrow bulb and scale engraved on the stem, and containing a maximum indicator, is not a standard article, but must be specially made. However, the scientific instrument makers will soon turn out two or three such thermometers for a very reasonable price. The scale should run up to, say, 110 deg. C., and the maximum indicator, after being read, can be re-set with a magnet.

When taking the temperature of a bearing, some very necessary precautions must be adopted. On no account must the thermometer be put in the oil when the motor is running; indeed, it may be said that it is not safe to put it in the oil at any time, because if the thermometer is broken, the most serious consequences will follow. The mercury will at once attack, and form an amalgam with, the white-metal of the bearing, converting it, in patches, into a pasty mass that will immediately seize on the shaft. It will even attack the brass oil rings, making them quite rotten. Gun-metal bearings run the same risk—in short, it is not worth while to incur the slightest danger of introducing a trace of mercury into any bearing.

The only safe place to insert a thermometer is in the eye-bolt hole in the bearing cap, and even here it is necessary to fit tightly a thin plug of cork. The reason for this is that, as a rule, the eye-bolt hole is drilled right through the cap, and the white-metal lining is exposed at the bottom of the hole. Having inserted the cork plug, the hole must now be filled with oil, in which the bulb of the thermometer is placed. Since the object in view is the detection of slow and progressive increase of temperature, developing, perhaps, over a period of weeks, the temperature of the cap may be assumed to be that of the bearing.

Each morning, during the period that the bearing is under observation, the maximum temperature reached during the previous run is read—and recorded—from the maximum indicator. The maximum air temperature must, of course, be noted as well, since the heat of the bearing will, to some extent, vary with that of the surrounding air. The best way is to plot both maxima to the same scale, when any undue increase of the bearing temperature relative to that of the air at once becomes apparent. As soon as a definite and persistent increase is noticed, steps should be taken to trace the cause. It may be that the oil has lost some of its viscosity, or become dirty and sticky, so slowing down the rings; or the rings themselves may not be running freely. It may be that the shaft is losing alignment—but, whatever the cause, ample warning is given, and when the cause is removed the temperature rise will revert to the normal.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

Stockport Accepts a Swiss Tender.

As we report in our "Contracts Closed" section, the Stockport Corporation has placed a contract with a Swiss firm for a 20,000-kW turbo-generator at the price of £34,307. The British tenders considered ranged from £52,220 to £60,815. In moving the adoption of the Electricity Committee's recommendation, the chairman of the Committee pointed to the wide differences between the British and Swiss tenders, and said that the Committee would have liked to have awarded the contract to a British firm, even if the price had been three or four thousand pounds higher. British firms, however, had not come down to rock-bottom prices, and the Corporation had to consider the ratepayers. A number of members of the Council refused to support the recommendation, and it was suggested that negotiations should be carried out with British firms before any tender was accepted. Eventually, however, the proposal was approved, 32 voting for it and 26 against.

In a statement issued to the Press on February 2nd, Mr. D. N. Dunlop, director of the British Electrical and Allied Manufacturers' Association, said that it had been hoped that the recent legislation would provide increased employment for British labour in the extension of generating stations. It was found, however, that supply undertakings were using their privileged position to purchase foreign plant and endeavour to force British prices down to a Continental level; the national scheme was in danger of becoming a happy hunting ground for the retailers of foreign plant. The Stockport Council had ignored an offer by the B.E.A.M.A. to treat further in the matter. It was maintained that British plant, on an efficiency basis, justified itself at a price 80 per cent. above that of foreign plant, quite apart from all considerations of employment, national production, and taxation. "We believe the time has come for the public to demand an inquiry into the circumstances under which corporations like Edinburgh, Stockport, Newport (Mon.), York, and Stepney have placed orders for generating plant abroad. The British manufacturer has nothing to fear from such an inquiry: he believes that the interests of the consumer, the ratepayer, and the nation are not being served by such a policy, and that the loss to the nation, material and moral, incurred by using the national scheme merely to purchase foreign plant, will be such as to endanger the whole future of electricity supply in this country." In a rejoinder to this statement, Alderman M. McGregor, Stockport, alleges that the National Scheme is being used by the manufacturers "as a cloak to extract large sums of money out of the pockets of the already hard-hit and overtaxed British taxpayer." He asks if the Association's offer to negotiate did not imply that the British firm's tenders were inflated, and that if there had not been foreign competition the prices would have been insisted upon. The alderman says that the Stockport Council is thoroughly patriotic, but cannot throw away the ratepayers' money. He, too, states that he would welcome a public inquiry.

South Africa and British Goods.

The Capetown correspondent of the *Chamber of Commerce Journal* states that towards the end of last year, Durban, "the most British and patriotic city in the Union, which previously boasted that not half of one per cent. of its electrical equipment came from outside Britain, had to give an order for electrical transformers to a foreign firm, and several councillors stated that, while they were always prepared to give British goods a preference of 10 per cent., or even a little more, they could not go to 18 or 20 per cent. They also stated that some British municipalities were sending orders to the Continent when the difference in price was little over 5 per cent."

Municipalities and Foreign Plant.

The British Electrical and Allied Manufacturers' Association has produced a special publication, entitled "Foreign Plant in British Power Stations: The Case for Support of National Production" (1s. net). The study commences with an expression of the axiom that the economic strength and security of this country depends above all upon industrial production, and a refutation of the theory that financial and commercial transactions can compensate for industrial depression. It is shown that while foreign countries have heavy tariffs, Great Britain remains practically unprotected—a dumping ground for the exports of all countries. The lower standards of living enable Continental manufacturers to produce more cheaply than the British, but the main obstacle to national recovery is held to be taxation. A comparison of the total and *per capita* taxation in various countries is made to show how unfavourably this country is placed. Although in electrical manufacturing alone the proportion of taxation costs is only 4.7 per cent., regard must be had to the taxation component of the raw material costs, labour costs, and factory and commercial expenses. Coming to the immediate subject, it is shown how fallacious it is for British undertakings to think that they are saving money when they place orders abroad. From the national point of view the payment of unemployment benefit counters any local saving, apart from the moral effects of unemployment. Dealing with raw materials, the brochure points out that the Swiss manufacturer is more favourably situated for the purchase of iron and steel than the British manufacturer, and states, incidentally, that although Swiss tenderers for electrical plant have maintained a pretence that they would employ British materials, and have thus gained a considerable number of orders in this country for generating plant, they have evidently not implemented their promises. The distribution of production costs in Great Britain, Germany, and Switzerland, shown in tabular form, is accompanied by a statement that the British manufacturer must quote selling prices 27 per cent. above those quoted by German and Swiss competitors before he can make any profit at all. To compete on level terms the British manufacturer would be forced to buy foreign raw material and have his plant practically completed abroad; the industry would become an assembling industry of small national economic importance. Departing from the question of initial prices, that of ultimate costs is dealt with. The small number of British undertakings which have purchased foreign plant points to a very strong reason for the favour shown to British plant. This lies in the more efficient working of the latter, and it is claimed that those undertakings which have installed foreign plant have incurred very serious losses. A table dealing with Newport (Mon.), Edinburgh, and York gives the total cost of fuel employed in connection with foreign plant for four separate years. Against these figures are placed the costs if British plant had been employed, and the conclusion is arrived at that during the four years Newport incurred a loss of £42,155, Edinburgh a loss of £77,801, and York one of £17,829; these figures are capitalised at £184,000, £95,000, and £200,000. The outcome, according to the brochure, is as follows:—"Allowing for the fact that the foreign plant was, on an average, about 20 per cent. less in price than the British, each of these undertakings has actually paid 80 per cent. more than the British price if differences in operating efficiency are considered, and they have now perhaps the most expensive plant in the country." Their action is attributed not so much to the engineers as to the electricity committees—the grasping of the lay mind at an immediate saving.

There are two appendices: one sets out orders for generating plant placed abroad by British municipalities and companies over the period 1919-1927 (33 cases); and the other dealing with the conditions in, and the methods of, the Swiss electrical industry.

Local Exhibitions.

PERSHORE.—The latest of the series of electrical exhibitions organised by the Shropshire, Worcestershire and Staffordshire Electric Power Co. is being held at Pershore. The rural nature of the district is emphasised by the company's description of Pershore as the "district where the plums come from." Five Evesham contractors and one local firm are taking part in the show, which closes to-morrow (Saturday) after a four days' run. The company is certainly entitled to the plums of Pershore, as well as to the other fruits of its enterprise throughout its area of supply.

KIRKBURTON.—Under the auspices of the Electrical Distribution of Yorkshire, Ltd., an exhibition of domestic electrical appliances is being held until February 18th at the Drill Hall, Kirkburton, where there are daily demonstrations in cooking, washing, and other household operations by electricity.

Recent Contract.

The GENERAL ELECTRIC CO., LTD., has sent us particulars of the street lighting installation at Paisley, for which it has supplied 1,100 "Paisley" units. These units, which are employed in the lighting of the residential areas of Paisley, consist of complete standards, at the base of each of which there is accommodation for fuses and an automatic time switch. They are fitted with spherical "Superlux" globes 16 in. in diameter, equipped with two 100-W "Osram" gas-filled lamps. Some 280 specially designed G.E.C. lanterns, each equipped with two 300-W "Osram" lamps, also provide the whole of the main street lighting at Paisley. These are suspended from the original main street arc lighting pillars.

The Australian Radio Industry.

According to the Sydney (N.S.W.) *Daily Guardian*, the position of the radio receiving set manufacturing industry of Australia is seriously threatened by the "dumping" of cheap American receivers. The trouble is said to be due mainly to the alteration of the wavelengths of the Melbourne and Sydney broadcasting stations from over 1,000 metres to under 500 metres. The American sets were unsuitable for the longer wavelengths, but this handicap having been removed, American importers were able to send apparatus worth over £300,000 into Australia during 12 months. The industry calls for complete protection by a virtually exclusive tariff.

The Central Scotland Transmission Towers.

It is stated that the quantity of steel required for the towers which are to be erected in connection with the Central Scotland Electricity Scheme is 5,000 tons. The material will be rolled by Messrs. William Beardmore & Co., Ltd., while the constructional work is to be undertaken by Messrs. William Bain & Co., Coatbridge, and the galvanising by Messrs. Frederick Braby & Co., Ltd., Glasgow.

Indian Tariff Changes.

A reproduction of the revised Indian tariff which came into force on January 1st was published with last week's *Board of Trade Journal*. Among the articles affected are electrical control and transmission gear, copper wires and cables and transmission line apparatus.

The German Electrical Industry.

The *Deutsche Bergwerks Zeitung* says that the generally improved situation in Germany has affected the electrotechnical industry, which in the last quarter experienced very good home business. Extensions and improvements necessitated many purchases of electric power and lighting plant, telephone apparatus, and conveying plant. Fresh orders were given by the Reichsbahn, the small tramways, and the industrial railways. The development of business in police call, fire alarm and mine signalling apparatus is satisfactory. Good orders were also received for electromedical apparatus and other scientific instruments. The demand for incandescent lamps has further increased. The struggle in the world market continues to be very severe.—*Reuter's Trade Service* (Dusseldorf).

Burndept Affairs.

Referring to the recent dismissal by Mr. Justice Romer of a petition for the compulsory winding-up of the company, Mr. C. W. Rooke, the receiver and manager of Burndept Wireless, Ltd., states that the company has now definitely "turned the corner." Sales during the first six months of his receivership steadily increased, and it is anticipated that the progress will be maintained. Substantial economies have been effected in the administration and organisation of the business, which is now being conducted on sound and practical lines. The company has put on the market a new "Screened Four" receiving set, for which there has been a great demand.

Electric Power in Industry.

Further industries in Northern Ireland are dealt with in Preliminary Report No. 2 upon the 1924 Census of Production, issued with the *Board of Trade Journal* for February 2nd. It is shown that in the grain-milling trade there were 476 kW of electric generators and 901 h.p. of electric motors. Other industries reported as follows:—Bread, biscuit, and sugar confectionery trades: Generating plant, 290 kW; motors, 1,812 h.p. Creameries and bacon curing, preserved foods and ice trades: Generating plant, 250 kW; motors, 424 h.p. Brewing, distilling, aerated waters, &c., trades: Generating plant, 694 kW; motors, 1,535 h.p. Food, drink, and tobacco trades: Generating plant, 1,710 kW; motors, 4,672 h.p.

Electrical Finance in Luxemburg.

The Government of Luxemburg has been authorised to raise a loan of 25 million fr. (about £142,850) in order to financially support the company which has been formed to undertake the supply of electricity for power and lighting purposes throughout the Grand Duchy. The sum mentioned will be loaned to the company for a period of six years, free of interest.

Unemployment.

During the week ended January 23rd the number of unemployed persons on the books of the Employment Exchanges fell from 1,193,810 to 1,178,700, a decrease of 15,110. On January 24th, 1927, the total was 1,348,720.

A Report on Venezuela.

Mr. H. Bancroft Livingston, British Consul at Caracas, has prepared a report upon Venezuela for the Department of Overseas Trade (Stationery Office, 9d. net). This mentions the growing prosperity, and political stability which characterise the Republic, and points to the scope for development which exists in many directions. Dealing with trading methods, Mr. Livingston says that at present the representation of United Kingdom firms is in the hands of Venezuelan agents. The population and trade of Maracaibo justify separate representation there, while Guanta will also probably be a suitable centre before very long. Again it is insisted that catalogues must be in Spanish; measurements and weights in the metric system; and prices in Venezuelan currency.

A Novel Radio Workshop.

A great deal of prominence is being given nowadays to radio-receiving sets which can be assembled without tools by novices in a very short time. Messrs. Whiteley's, who are always up-to-date, have conceived the idea of providing facilities for purchasers of the components of such sets. A part of their

Assembling "Master Three" Sets at Whiteley's.

Bayswater stores has been arranged for the display of Mullard "Master Three" sets and accessories, where, under expert guidance, buyers may assemble the receivers on the spot. It will be noticed, too, from the accompanying picture, that the ubiquitous "easy-payment" system is employed.

Foreign Loans in the United States.

Commerce Reports publishes details of foreign securities offered in the United States during the fourth quarter of 1927. This list includes the following:—Norwegian Hydro-Electric Nitrogen Corporation, $15,715,500; Vamma Water Power Co. (Norway), $5,000,000; Shawinigan Water & Power Co. (Canada), $24,000,000; Ottawa Light, Heat & Power Co., Ltd., $597,000; Power Corporation of Canada, $1,280,000; Canadian Hydro-Electric Corporation, Ltd., $12,500,000; and the Shinyetsu Electric Power Co., Ltd. (Japan), $7,650,000.

German Domestic Apparatus Exports.

According to the United States Trade Commissioner in Berlin there was a considerable increase in the exportation of domestic electrical appliances from Germany during the first nine months of 1927. The weight of these exports was 1,017 tons, and their value 4,924,000 marks. Electric irons formed a large part of this volume—420 tons, valued at 984,000 marks. In 1926 896 tons of appliances, valued at 5,128,000 marks, were exported. The principal destinations of this apparatus in the first nine months of 1927, with the 1926 figures in parentheses, were as follows: Netherlands 50 tons (47); United Kingdom 41 tons (31); Italy 41 tons; Czecho-Slovakia 36 tons (26); Argentina 23 tons (27); Austria 23 tons (17); and Denmark 21 tons.

The German H.P. Insulator Syndicate.

It is stated that the German High-Pressure Insulator Syndicate, which has existed for 17 years, was prolonged in December for a further period of five years. The syndicate includes all the important makers of h.p. porcelain insulators, and the members are said to effect an interchange of experience, patents, &c., while the syndicate itself regulates prices and sale conditions.

Ericsson's in Rumania.

A branch of the L.M. ERICSSON TELEPHONE Co., Stockholm, has recently been established in Rumania, the company having acquired the only telephone factory in that country.

Electrical Works' Hospital Funds.

The management, staff, and employés of Callender's Cable and Construction Co., Ltd., continued their charitable efforts during 1927. The report of the Hospital and Distress Fund for the year shows that £980 was raised, slightly more than in 1926. After meeting the needs of distressed members of the Fund, a sum of £930 was distributed among 17 hospitals and kindred institutions. The voluntary death levy scheme yielded an average of over £28 in 11 cases, which was greatly appreciated by bereaved relatives.

The *Siemens Magazine* for February contains the accounts of the Employés' Hospitals, &c., Fund for 1927, in connection with Messrs. Siemens Bros. & Co., Ltd. The fund shows an income (including a balance of £1,764 brought forward) of £2,985. A total of £1,554 was disbursed among a number of hospitals and other charitable institutions, leaving a balance of £1,432 to be carried forward.

Railways and Road Transport.

In a recently-issued statement, Mr. D. A. Bremner, director of the British Engineers' Association, refers to the controversy which has arisen over the decision of the railway companies to apply for road transport powers. Without pronouncing upon the merits and demerits of the proposal, Mr. Bremner says that he "cannot help doubting the economic soundness of the growing tendency to develop road transport to the detriment of the traffic density factor of our railways, to which we are so deeply and irrevocably committed, and on which so large a number of our people has been allowed or induced to become directly or indirectly dependent for a living." He comes to the conclusion that the matter is a proper subject for the consideration of a Royal Commission or a competent committee of inquiry.

The question of the attitude to be taken by industry towards the Bills promoted by the railway companies for powers to run road transport was discussed at the Grand Council meeting of the F.B.I. on February 1st. It was decided to appoint a committee to consider what amendments to the railway companies' Transport Bills are necessary to safeguard the interests of the public and users of transport, and to empower the committee to negotiate with the railway companies with a view to the inclusion of these amendments in the Bills, and, failing success in negotiation, to request the Government to hold a full inquiry before the Bills receive a second reading. The railway companies this week issued a statement denying the necessity for an inquiry.

Modern Store Lighting.

The accompanying illustration depicts the interior of the new extension building of the Civil Service Supply Association, Strand. A feature of the Strand entrance and the various showrooms in the new building, is the electric lighting; this

The New C.S.S.A. Stores.

has been carried out in a dignified and scientific manner, by means of Siemens "Silvaray" glassware fittings and gasfilled lamps. The electrical engineers were Messrs. Rashleigh, Phipps and Co., Ltd., 147, Oxford Street, W.1.

New French Company.

La Société Aluminium Cable is the name of a new company which has lately been formed in Paris with a capital of three million francs to manufacture aluminium cables.

American Telephone Service Ownership.

It is stated that the total investment in telephone plant and equipment in the United States on January 1st was approximately $3,500,000,000 (about £700,000,000). During 1927 the telephone companies of the country added about $250,000,000 (over £50,000,000) to their total investment in the business. The problem of raising this enormous sum is being solved by attracting the scattered savings of hundreds of thousands of small investors all over the country. The American Telephone and Telegraph Company, the largest component of the Bell system, has to-day more than 420,000 stockholders, showing an increase during the past twelve months of more than 20,000. Over 73,000 of this total are Bell System employés, and stock in the company is now being bought by small monthly salary deductions by more than 190,000 workers.

Irish Free State Electrical Imports.

The imports of electrical goods, excluding machinery, into the Irish Free State during December last were valued at £35,665, as compared with £37,004 in the corresponding month of 1926. The aggregate imports during the whole of the past year are returned at £385,648, as compared with £450,249 in the preceding year, a decrease of £64,601.

Trade Announcements.

The FOSTER ENGINEERING CO., LTD., has opened a branch at 9, Brunswick Street, Belfast.

The telephone number of FURSE WHOLESALE, LTD., Traffic Street, Nottingham, is now 8213.

MESSRS. J. T. HALSEY & SONS, electrical engineers, of 119, High Street, Southend-on-Sea, are removing to 6, Southchurch Road.

Messrs. LAURENCE SCOTT & CO., LTD., Norwich, have opened an office at Premier House, 150, Southampton Row, W.C.1 (telephone Museum 2460), under the supervision of Mr. J. A. Hunn, O.B.E., A.M.I.E.E., who has been connected with the company for over 30 years. The company confines itself to d.c. machinery only, in which it has specialised for 40 years.

Messrs. LEWENZ & WILKINSON, LTD., 25, Victoria Street, S.W.1, have been appointed sole agents for Great Britain and Northern Ireland for Messrs. Keiser & Schmidt, Charlottenburg, for the sale of their pyrometers and resistance thermometers.

The offices of the Power Condenser Sales Department and Mr. E. W. Dorey, of the TELEGRAPH CONDENSER CO., LTD., have been removed to Avenue Chambers, Vernon Place, Southampton Row, W.C.1. Telephone: Holborn 7072; telegrams: "Condensity, Westcent, London."

MESSRS. A. J. COLEMAN & Co. have commenced business as electrical and radio wholesale factors at 41, The Arcade, Northampton.

Messrs. MAVOR & COULSON, LTD., announce that Mr. William Rea has left their service and that Mr. J. Ditchfield, 18, Parr's Wood Road, Withington, Manchester, has been appointed their switchgear and control gear representative in the Lancashire, Yorkshire, North Wales, and Midland districts.

New Catalogues and Lists.

TUNGSTONE ACCUMULATOR CO., LTD., 3, St. Bride's House, Salisbury Square, Fleet Street, E.C.4.—A well-illustrated booklet dealing with the construction and operation of "Tungstone" house-lighting batteries.

THE EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, E.C.4.—A folder containing prices and illustrations of the company's automobile lamps.

KORTING & MATHIESEN ELECTRICAL, LTD., 711 & 715, Fulham Road, S.W.6.—The first number of the "K. & M. Quarterly Review," containing notes on the company's products and activities, particularly shop-window and factory lighting.

POPE'S ELECTRIC LAMP CO., LTD., 5, Arthur Street, New Oxford Street, W.C.2.—A February calendar-blotter advertising "Elasta" lamps.

MESSRS. J. G. STATTER & Co., Queen Anne's Chambers, Westminster, S.W.1.—Leaflet No. X203A, describing the company's a.c. and d.c. circuit breakers (illustrated), and a calendar-blotter bearing a pretty view of Durham Cathedral.

BROOK MOTORS, LTD., Empress Works, Huddersfield.—A folder giving comparative performance curves of "Brook" and other motors, and an aerial view of the company's works.

THE MULLARD WIRELESS SERVICE CO., LTD., Nightingale Lane, Balham, S.W.12.—Leaflet V.R.65, illustrating and describing the company's low-temperature filament, screened-grid receiving valves. Priced.

THE WESTMINSTER TOOL & ELECTRIC CO., LTD., Westool Works, Putney Bridge Road, S.W.15.—A leaflet bearing an illustration and particulars of a new portable flexible-shaft grinding outfit.

MESSRS. DAVIES, KENT & STEWART, LTD., 17, Berners Street, Oxford Street, W.—A comprehensive illustrated and priced catalogue of plugs and sockets, ceiling roses, adaptors, wiring system, &c.

THE D.P. BATTERY CO., LTD., Bakewell, Derbyshire.—An illustrated folder giving prices and particulars of "Kathanode" batteries for radio purposes (h. and l.t.).

MESSRS. MAVOR & COULSON, LTD., 47, Broad Street, Mile End, Glasgow.—A February calendar-blotter advertising the company's "Samson" coal-cutter with jacking device.

MESSRS. HERBERT MORRIS, LTD., Loughborough.—An illustrated catalogue of overhead hand cranes.

MR. GEORGE BARNARD, 1, Nile Street and Sheepcote Street, Birmingham.—A blotter containing a calendar and a stock list of "Vinculum" concrete covers for electrical purposes.

MESSRS. YOUNG, OSMOND & YOUNG, LTD., Excelsior Works, The Broadway, Bexley Heath, Kent.—A well-produced brochure dealing generally with the subject of heating and ventilating by electricity, with particular reference to the company's "Unity" tubular heating system.

METRO-VICK SUPPLIES, LTD., Trafford Park, Manchester.—Publication No. 7117/10, a booklet for the trade containing detailed instructions for the installation, testing, and operation of the company's three-valve sets for a.c. mains or batteries. Illustrated and priced.

GRAHAM AMPLION, LTD., 25-26, Savile Row, Regent Street, W.1.—An illustrated and priced folder, describing fully the "Vivavox" gramophone pick-up.

MESSRS. W. F. DENNIS & Co., 70, Queen Victoria Street, E.C.4.—An illustrated leaflet advertising "Tekade" radio valves.

MESSRS. J. H. SANKEY & SON, LTD., Essex Wharf, Canning Town, E.16.—Leaflets dealing with "Pyruma" plastic fire cement and other cements for boiler settings, insulating purposes, &c.

MESSRS. NORRINGTON & LONDON, LTD., 33, Brazennose Street, Manchester.—Publication No. 408, illustrating and describing the company's "Blaizolite" patent projector lanterns for all kinds of public and industrial lighting.

MR. H. J. POULTEN, 47a, Reginald Road, Forest Gate, E.7.—A price list of lamp-blown glassware for laboratory, electrical and other purposes, and a pamphlet drawing attention to the firm's glass fuse tubes.

THE CHLORIDE ELECTRICAL STORAGE CO., LTD., Clifton Junction, near Manchester.—Leaflet M4, dealing with the company's mass-type cells for electric bells. Priced.

MESSRS. BULPITT & SONS, LTD., Swansea Works, Birmingham.—A priced and illustrated catalogue of electric kettles, steam cookers, urns, irons, &c.

Bankruptcy Proceedings.

JOHN BRABY, 93, Chertsey Road, Woking, Surrey, electrical engineer.—The first meeting of creditors was held recently at 29, Russell Square, W.C.1, when the case, being a summary one, was left in the hands of the Official Receiver as trustee of the estate. According to the statement of affairs the ranking liabilities were £312, against net assets of £37. Debtor attributed his failure to lack of capital and bad trade. He commenced business as an electrical engineer in June, 1924, on his own account. He was without capital, but borrowed £30 from his wife, the money being expended in the purchase of stock. The business did not prove successful, and in 1925 he borrowed £50 from a moneylender for use as working capital. In September, 1927, when he was owing £80 in respect of the two advances referred to, he opened a lock-up shop for the purpose of selling wireless and electrical goods. He was able to obtain stock on credit, but was unable to make the business pay, and, on being sued, he decided to file his petition. The following are creditors:—

	£		£
Braby, Mrs. S.	31	Lisenin Wireless Co. ...	24
Gray, C.	50	S.D.H. Mfg. Co.	20
Johnson & Phillips, Ltd.	21		

JOHN BAUGH (lately trading as John Baugh & Co.), merchant, 46, Fenchurch Street and 52, Gracechurch Street, E.C.—This bankrupt failed in February, 1923, and applied last week to Mr. Registrar Warmington at the London Bankruptcy Court for an order of discharge. Mr. Walter Boyle, senior Official Receiver, reported that the provable debts amounted to £19,081, and the assets, valued at £5,785, had realised only £3. The bankrupt started business in May, 1919, and twelve months later contracted to purchase and sell 30,000 electric fans to a firm in Bombay; the purchasers declined to take delivery of 28,000 of the fans, with the result that the vendors (Dick Nicholls & Co.) sued him, and the action was compromised by the bankrupt making a payment of £250 and giving a promissory note for £850, of which £700 was still owing. The applicant also sustained other losses. He attributed his insolvency to depreciation in the value of goods, breaches of contract on the part of foreign buyers, general depression in trade, and to ill-health. In the opinion of the Official Receiver the failure was caused by rash and hazardous speculations, and he opposed the application. His Honour suspended the discharge for two years and six months.

J. S. RHODES, electrical engineer, 102, Morley Street, and 74, Horton Lane, Bradford.—Last day for proofs for dividend February 14th. Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford.

J. E. CRACKNELL, wireless supplies dealer, &c., High Street, Manningtree.—Last day for proofs for dividend, February 15th. Trustee, Mr. H. S. Gotelee, Official Receiver, 9, Arcade Street, Ipswich.

H. WILSON, electrical contractor, &c., 1057, Grangefield Avenue, Thornbury, Bradford.—Supplemental dividend of 6¾d. in the £, payable at the Official Receiver's office, 12, Duke Street, Bradford.

H. A. PRATT, electrical engineer, Essex House, Lee Road, Devonport.—Receiving order made January 30th, on debtor's own petition.

Company Liquidations.

THOS. GUNN, LTD.—Particulars of claims to the liquidators, Messrs. F. H. Bennett and W. A. J. Osborne, 59, Chancery Lane, W.C.2, by February 28th.

QUICKFIX ELECTRICAL FITTINGS CO., LTD.—Winding up voluntarily. Liquidator, Mr. P. J. Ritchie, 38, Bath Street, Glasgow, and Mr. J. F. Ballantine, 33, Bath Street, Glasgow. A meeting of creditors was called for February 14th, at the Central Halls, 25, Bath Street, Glasgow.

Dissolutions of Partnership.

FIELDING & COTTON AND/OR CENTRAL WORKS, motor and electrical engineers, 39a, Market Street and Machpelah, Hebden Bridge, York.—Mr. F. Fielding and Mr. G. A. Cotton have dissolved partnership. Mr. Cotton will attend to debts and continue the business as the Central Works.

F. B. O. HAWES and E. G. KING, consulting engineers and accountants, 36 & 38, Kingsway, W.C.—Mr. F. B. O. Hawes and Mr. E. G. King have dissolved partnership. Mr. Hawes will attend to debts and continue the business.

H. SEYMOUR THOMAS & CO., electrical factors, 38, Charles Street, Cardiff.—Mr. H. L. S. Thomas and Mr. J. Llewellyn have dissolved partnership. Mr. Thomas will attend to debts.

Receiver Appointed.

BEKO LAMP CO., LTD.—A receiver has been appointed for the debenture-holders of this company. He is at present continuing the business, but will only be responsible for orders signed by him. His name is not legible in the official notice, but the address is A. E. Green & Co., 100 to 106, Moorgate Station Chambers, E.C.2.

Book Notices.

"This Airship Business." By E. F. Spanner. Pp. 435; illustrated. London: Williams & Norgate, Ltd. Price 25s. net.—The object of the book appears to be a criticism of the official policy in this country in connection with airship practice; but there also seems to be much of interest, historical and otherwise, in the development of the airship.

"Technical Drawing," by George Edwin Draycott, Wh.Ex. Pp. vii+232; figs. 285. London: Humphrey Milford. Price 6s. net.—This work is especially designed for use at evening classes and in junior technical schools. Its principal feature is perhaps its simplicity, and for this reason it should prove particularly valuable to the engineering student who, as in the case of perhaps most practical students, cannot afford to spend more time on drawing than is necessary to give him a brief insight into the preparation of working drawings. Throughout the book the subjects are based upon exercises in plane and descriptive geometry. As is mentioned in the preface, the general character of the book is "fluid" in order to allow free reference to and fro to suit various types or classes of students.

"Pitman's Dictionary of Industrial Administration." Edited by John Lee, C.B.E., M.A. London: Sir Isaac Pitman and Sons, Ltd. Issued in 30 fortnightly parts, 48 pp. each. Price 1s. 3d. net per part. A glance at Part I of this work, which is to be published on February 18th, suggests that the subject has been treated in a very comprehensive manner. The object of the work is to provide a complete encyclopædia of modern facts relating to industrial administration, factory organisation and business management. Its contributors number over 100 eminent authorities. The publishers have issued a detailed prospectus, which will be sent post free on request.

"The Call Indicator System of Automatic Telephony," by A. G. Freestone. Pp. xi+112; 19 figs. London: Sir Isaac Pitman & Sons, Ltd. Price 6s. net.

"Principles of Mechanism," by F. Dyson. Pp. viii+296; figs. 148. London: Oxford University Press. H. Milford. Price 12s. net.

Publications of the Technical Section of the Association of Engineering and Shipbuilding Draughtsmen—"The Centrifugal Pump and its applications," by M. Heath. Price 2s.

"Faraday House *Journal*." Vol. XII., No. 5. Lent Term. Also a well-illustrated pamphlet on the training of electrical engineers and features of the college.

Social Events.

The Igranic Electric Co.'s annual fancy dress dance took place on January 27th, at the Café Dansant. Approximately 550 guests were present, and the company included members of staffs from the branches of the Igranic Co. throughout the country. The originality and variety of the costumes made a very difficult task for the judging committee—Mr., Mrs. and Miss Wingrave and Mr. A. H. Mackley—but their decisions reflected the general opinion of the company. Twenty-two valuable prizes, presented by members and friends of the Igranic Electric Co., Ltd., were distributed by Mrs. A. H. Curtis. During the evening the opportunity was taken to make a presentation to Mr. A. H. Curtis (general manager) commemorating his 25 years' service with the company. The presentation was made by Mr. G. R. Thursfield (director and secretary of the company), in the absence of Mr. George A. Mower (chairman and managing director), who was unable to be present owing to ill-health. The present consisted of a "Compactom" gentleman's wardrobe in oak, a gold wristlet watch, and a gold cigarette case. The presents were subscribed for by directors and members of the staff and works.

The G.E.C. football dance held in the Lecture Hall at Magnet House on January 27th was very well attended, and an excellent evening was spent. The arrangements were in the hands of Mr. Knight, hon. secretary of the G.E.C. Football Section.

The fifth annual dinner and dance of the staff of Lighting Trades, Ltd. (incorporating J. & W. B. Smith, Ltd.), was held on January 27th, at the Piccadilly Hotel, W. Mr. H. J. Mitchell, the chairman of the company, presided, and was supported by other members of the board. Mr. Mitchell briefly reviewed the activities of the company during the past year, special mention being made of the merging of the business of J. & W. B. Smith, Ltd. Mr. A. T. Metcalfe, general manager, expressed the thanks of the staff, and assured the directors of their loyal and whole-hearted co-operation.

On January 28th Councillor H. J. Galliers, Brighton, entertained his employés to dancing, whist, and a supper. During the evening Mr. Galliers was presented with an onyx fountain-pen desk equipment, while Mrs. Galliers received a bouquet and a box of chocolates.

Following the recent opening of the new electricity showrooms of the Spenborough Urban District Council, Cleckheaton, the staff of the showrooms were last week entertained to dinner by Mr. A. Pickersgill, the Council's electrical engineer, and Mrs. Pickersgill. The whole meal was cooked on the showroom premises by electricity, by Miss Aldrich, of the Jackson Electric Stove Co., Ltd., who is giving daily public demonstrations.

Proposed Joint Engineering Council.

A meeting representative of employers and employés in the engineering industry in the London area has decided to form this month a London District Engineering Council for the purpose of discussing problems affecting the industry.

Indian Cable Company's Sports.

The Welfare Association of the Indian Cable Co., Ltd., Calcutta, opened its new recreation grounds at Tatanagar on January 14th, by holding its second annual sports. Sack-fights on poles, obstacle races, in which cable drums helped to baulk the competitors, potato races for the rejas (aboriginal women), and races for the coolies, helped to enliven the usual sprints and hurdles of a conventional sports meeting. Two Pathans with bag-pipes urged the competitors to victory to strains of "Cock-of-the-North," "Bonny Dundee," and other highland airs, cleverly rendered with true Scottish pomp and ceremony. This year P. K. Sarkar, a Bengalee, carried off the championship cup presented by Mr. F. W. Leake (Calcutta director); he was closely followed by P. C. Chatterjee, both of the Wire Mill. The Welfare Committee has a number of successful undertakings, including a small dairy farm of eight cows to ensure pure milk, a dramatic society and a library. Each section has its committee electing a member to the central body which controls all financial matters.

Price Reductions.

GRAHAM AMPLION, LTD., announces that the prices of "Amplion" cone speakers, models A.C.4 and A.C.4.M, have been substantially reduced.

A Hardy Motor.

Messrs. Higgs Motors inform us that some Australian customers recently subjected one of their 4-h.p. motors, taken from stock, to a test to prove its ability to run under adverse conditions. The motor was submerged and ran intermittently in rain water for over a week without suffering any injury or mishap.

For Sale.

Darwen Corporation has for disposal one 150-kW and one 300-kW d.c. steam-driven dynamos with condensers, valves, and piping. Bethnal Green Hospital has for disposal surplus generating plant. East Ham Electricity and Tramways Department invites offers for one 350-i.h.p. cross-compound engine, direct-coupled to a 250-kW generator. Messrs. L. Farmer & Sons will sell by auction on February 14th, on the premises, the freehold premises of Straker Squire, Ltd., Angel Road, Edmonton, N., together with machine tools, engineering plant, &c. Mr. G. R. Lightfoot will sell by auction on February 22nd, at 13, High Holborn, W.C.2, electrical and wireless stocks. (See our advertisement pages to-day.)

New Belgian Companies.

Among the companies recently formed in Belgium are the following: Société Générale d'Exploitations Electriques de Lodz et Extensions, Brussels, capital, 125 million fr., to take up interests in electrical, tramway and gas undertakings; La Union Belge des Producteurs d'Electricité, Brussels, capital, 1,263,000 fr., for the organisation of the generation and transmission of electricity; Tramways Unifiés de Liége et Extensions, Liége, capital, 27 million fr., to construct and operate tramways, motor-'buses, and other means of transport; Lampes et Entreprises Electriques, Ninove, capital, four million fr., to manufacture and sell electrical apparatus, especially for lighting purposes; Lampe Union, Vorst, capital, 100,000 fr., to make and sell electric lamps, &c.; and Elektrische Isolierrohrwerke, Hergenrath, capital, 153,000 fr., to manufacture electrical installation material, &c.

New Swiss Company.

A new company has lately been formed in Neuchatel (18, Rue des Beaux Arts), with the title La Société "Favarg" Fabrique d'Appareils Electriques, to manufacture telegraphic, telephonic, and other electrical instruments and apparatus.

New Municipal Showrooms.

The Scarborough Electricity Committee proposes to convert 89 and 89a, Westborough into showrooms at a cost of £2,000.

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price Feb. 7th.	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5¾d.	...
a	Ammoniac, Sal ... ... per ton.	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£25	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3½d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£13 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3¼d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£107 to £112	...
b	,, Wire ... ... per lb.	1/6 to 2/-	...
b	,, Sheet ... ... ,,	1/3 to 2/9	...
p	Babbitts Metal and Anti-friction Metal—		
	Grade I ... ... per ton net.	£218	£9 dec.
	Grade II ... ... ,, ,,	£151	£6 dec.
	Grade III ... ... ,, ,,	£80	£2 dec.
c	Brass (rolled metal 2" to 12" basis) per lb.	9¾d.	...
c	,, Tubes (solid drawn) ... ... ,,	11½d. to 11¾d.	...
c	,, Wire, basis ... ... ,,	9¼d.	...
c	Copper Tubes (solid drawn) ... ,,	1/1	¼d. inc.
c	,, Bars (best selected) ... per ton.	£92	...
c	,, Sheet ... ... ,,	£94	...
c	,, Rod ... ... ,,	£92	...
d	,, (Electrolytic) Bars ... ,,	£66 15s.	5/- dec.
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ,,	£76 15s.	5/- dec.
d	,, ,, H.C. Wire per lb.	9¾d.	...
f	Ebonite Rod ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/9	...
h	Gutta-percha, fine ... ... ,,	6/8	...
h	India rubber, Para fine ... ... ,,	1/8½	...
l	Iron Pig (Cleveland No. 3.) ... per ton.	65/-	...
l	,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g	Lead, English pig ... ... ,,	£22 5s.	20/- dec.
g	Mercury ... ... per bot.	£22 to £22 5s.	2s. 6d. dec.
e	Mica (in original cases) small ... per lb.	3d. to 8/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings ,,	1/9½	...
p	,, ,, drawn bars & rods ,,	1/8	...
p	,, ,, rolled strip & sheet ,,	1/2½	...
p	,, ,, wire... ... ... ,,	1/8½	...
e	Platinum ... ... per oz.	£17 15s.	...
d	Silicium Bronze Wire ... ... per lb.	10½d.	...
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
n	Tin, Block (English) ... ... per ton.	£238 to £239	£12 5s. to £12 10s. dec.
s	,, Wire, Nos. 1 to 16 ... ... per lb.	4/2	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

In their lead report dated February 4th, Messrs. James Forster & Co. stated:—"Apart from a slightly better demand here there is little change in the general position, supplies being more than ample for present requirements. So long as this continues to be the case, no temporary advance can be expected to be maintained for long. A factor, however, not to be lost sight of, is the possible outcome of the meeting this month with the men at the Broken Hill Mines on the question of wages, which might easily develop into a strike or lock-out. This would, of course, have an immediate effect on the price of lead."

Lighting and Power Notes.

Barnstaple. — CONSULTING ENGINEER'S REPORT. — Various portions of the plant at the Corporation electricity works, and the system of cable laying in bitumen, are criticised in a report which has been received by the Corporation from Mr. J. H. Rider, who was called in to advise. According to the *Western Morning News*, the finances of the undertaking have caused considerable concern both to the Council and the ratepayers, with the result that the Council recently formed an Advisory Committee and decided to consult an electrical expert. Mr. Rider, in his report, it is understood, states that the principal factor against the successful working of the station, from a financial point of view, is the inefficiency of the steam-raising plant, which was installed when the undertaking was opened. He condemns the present switchboard, and also the bitumen method of cable-laying. The major portion of the cable in the town is now laid in bitumen, which was the system adopted at the start, though, where replacements have been necessary, the Council has been using the armoured type.

Blackburn.—LOAN.—A sub-committee of the Corporation has been appointed to inquire into the question of applying for sanction to borrow a further sum of £60,000 to provide for future expenditure in connection with mains, services, and sub-stations. It has also been decided to erect additional sub-stations at a cost of £8,500 in connection with the supply of electricity to the central area and the Copy Nook and Further-gate districts.

Blackpool.—LOAN.—The Town Council is applying for sanction to borrow £2,000 for transformers and switchgear.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—An extensive project for the development of hydro-electric power on the English River, which lies partly between the Province of Ontario and partly in Manitoba, was advanced a further stage at a recent conference of representatives of the Federal, Manitoba, and Ontario Governments, and others interested. A tentative agreement was arrived at, subject to the approval of the Governments concerned, for the construction of a dam at Lac la Seul to provide a storage basin for the waters of the river. The reports of the hydraulic engineers of the Ontario Government estimate that the water course is capable of supplying 212,000 h.p. within its Ontario section. It will be in part an inter-provincial scheme with Manitoba. The dam is estimated to cost approximately half a million dollars. Ontario's share of the power generated will be available for the supply of the Red Lake and Woman Lake mining camps in the Patricia district.

Chester.—LOAN.—The City Council has decided to obtain sanction to a loan of £17,000 to meet the cost of extensions of underground cables. Some of the mains which are to be relayed were put down 30 years ago.

Continental.—CZECHO-SLOVAKIA.—The programme of the Government for the development of the water resources of the country has recently been outlined by the Minister of Public Works. The outstanding project is that of the proposed system of canals to connect the Elbe, Danube, and Oder Rivers. The completion of the work on the Middle Elbe between Melnik and Koniggratz, in addition to providing a 110-mile stretch of navigable water, will make available 226,000,000 kWh annually. Similar work on the Elbe between Aussig and Lobositz will produce 25,000 h.p. Improvement of the Moldau between Prague and Budweis will open it for considerable traffic, and at the same time produce annually over 700,000,000 kWh. The further development of the Moldau between Prague and Kamyk will provide sufficient power to meet the requirements of the whole of Central Bohemia. Similar projects are under consideration on the Upper Moldau, the Beraun, the Wottawa, the Tepl, the Iser, the Aupa, the Adler, and the Chrusimka. The backbone of water development in Slovakia is the Waag, which can produce 230,000 h.p. between Sillein and Komorn. The first project to be undertaken, however, will be the installation of power plants between Puchov and Trenchin to produce 70,000 h.p. sufficient to meet the demands of Slovakia and Eastern Moravia for the next few years. A 34,000-h.p. plant is projected at Terebl'a-Rika, in Carpathian Russia, but its construction will depend upon the development of a demand for electricity in that region.

RUMANIA.—A new company is in course of formation under Belgian auspices to establish a large steam-operated power station at Rusa-Untana, to supply electricity in the Banat district of Rumania. The plant will be located near to and in conjunction with the Banat collieries.

BELGIUM.—In order to meet the increasing demand for power in its area, the Compagnie Auxiliaire d'Electricité is preparing plans for extensions to its plant. A new power station, with high-pressure steam boilers, is to be erected on the banks of the River Scheldt, near Antoing, while a second turbo-generator, together with the necessary boilers, is to be installed at the power station at Hoeylaert-Groenendael.

Derby.—ELECTRICAL DEVELOPMENT.—The Corporation Electricity Committee proposes to spend £92,850 on electrical development during the year ending March 31st, 1929. This sum will include £40,000 for mains, £5,000 for transformers, £5,000 for motors, and £25,000, part of a scheme estimated to cost £85,000 for a new turbine, boiler, switchgear, and accessories.

Douglas (I. of M.).—NEW PLANT.—The Corporation Electricity Committee has recommended that, subject to a favourable report being obtained from Mr. Allot, civil engineer, the site at Pulrose for the proposed power station be approved, and that subject to the foregoing, the Committee be authorised to place the necessary contracts and proceed forthwith with the erection of one 1,000-kW set on the site to meet next season's demands.

Dundee.—CABLES OVER THE TAY.—The Dundee Harbour Trust has been informed by Mr. A. E. McColl, of the Central Electricity Board, that the scheme of the Board to carry h.p.

cables over the Tay between Tayport and Harecraig has been practically abandoned. It is now proposed that the overhead lines should cross the river at a point near to where the River Earn discharges into the Tay.

Durham.—CONFERENCE OF LOCAL AUTHORITIES.—A private conference of local authorities was held at Stockton-on-Tees on January 24th to discuss their attitude towards the Bill being promoted in Parliament by the Cleveland and Durham County Electric Power Co. The Town Clerk of Hartlepool stated that in all 31 local authorities had been invited to the conference, which was called to consider what opposition, if any, should be offered to the Bill by authorities in whose areas the company was distributor. A conference held at York on January 16th, attended by the larger municipalities in the company's area of supply, had decided that in view of the varied character of the opposition, there should be an adjournment so that each authority could consider the question separately, instead of jointly, especially as most of the municipalities represented were either undertakers or taking a bulk supply. During the discussion it was suggested that the company should be approached to ascertain what concessions it was willing to make, and that only two petitions should be lodged, embodying all points upon which the authorities would require agreement or safeguards. It was proposed that a committee should be appointed to take the necessary steps. The following resolution was adopted:—"That this conference, representing boroughs, urban and rural districts in the counties of Durham and North Yorkshire, is of the opinion that the Bill promoted by the Cleveland and Durham County Electric Power Co. should be opposed with a view to securing protective clauses, and that each authority concerned should join in opposing the Bill." It was also agreed that if the resolution was confirmed, each authority should submit a statement of grounds for opposing the Bill to the town clerks of West Hartlepool and Stockton, and a second conference should be held later at Stockton.

Eastbourne.—ELECTRICITY EXTENSIONS.—The Corporation Electricity Committee has decided upon extensions as follows: Extensions to various sub-stations, £19,905; transformers, £2,263; switchgear, £1,189; mains, £8,007.

Halifax.—LOANS.—The Corporation Electricity Committee has recommended that application be made for sanction to loans of £30,000 for mains, £13,000 for transformers and switchgear, and £25,202, being the balance of the cost of the Halifax-Huddersfield linking-up scheme.

Hull.—ELECTRICITY EXTENSIONS.—The Corporation Electricity Committee has decided to proceed with a complete scheme of extensions at Sculcoates power station, at an estimated cost of £352,000 for plant and £129,500 for buildings, &c.

ASSISTED WIRING SCHEME.—The Committee has adopted a scheme of assisted wiring, and is seeking sanction for a loan of £25,000 in connection therewith.

Ilford.—LOANS.—The Corporation Electricity Committee is seeking sanction to a loan of £21,800 for a new sub-station, convertors at the main generating station, and Gants Hill, and Goodmayes sub-stations, and switchgear. The Committee has obtained sanction to a loan of £5,000 for domestic apparatus to be let out on hire, and £2,000 for the hire of installations.

Kingston-on-Thames. — LOAN SANCTIONED. — The Town Council has received sanction to a loan of £42,150, being part of a sum of £66,563, for the conversion of the system of supply. The Electricity Commissioners are considering the approval of the balance.

ELECTRICITY CHARGES.—For shop window lighting after business hours, electricity is to be supplied at 2½d. per kWh, with a special meter rent of 12s. 6d. per quarter for the two winter quarters only, contracts to be for three or five years.

Leeds.—ASSISTED WIRING SCHEME.—The City Council has approved a recommendation of the Electricity Committee, that application be made for sanction to borrow a further £20,000 in connection with the assisted wiring scheme. It is stated that nearly 5,000 applications have been received under this scheme.

London.—SIEPNEY.—An inquiry was held at Limehouse Town Hall on February 1st by Col. T. C. Ekin into the Borough Council's application for a Special Order authorising it to extend the Limehouse power station and to acquire compulsorily certain lands at present used for commercial and housing purposes. Objections were raised by some of the firms and tenants concerned. According to the *East London Advertiser*, the Town Clerk said that between 1917 and 1927 the electrical energy sold increased from over 27 million kWh to 48 millions, an increase of 21,052,121 kWh. Of that total number of kWh sold, over 32 millions represented power and bulk supplies. The position was such that it became necessary for the borough electrical engineer and manager to draw up proposals for the consideration of the Council. His report was unanimously approved by the Borough Council, and the Electricity Commissioners and the London and Home Counties Electricity Authority both sanctioned the proposals to carry out the first stage of the extension at a cost of £398,000. Additional accommodation was required for coal storage. The Electricity Commissioners will give their decision in due course.

Northern Ireland.—ARMAGH.—An electricity supply for the district was formally inaugurated by the chairman of the Urban District Council on January 25th. The plant includes three engines of 6, 80, and 160 h.p., the smallest machine being used for starting purposes and lighting the station, and the other two for lighting the district. The electricity charges are 9d. per kWh for private lighting, 4d. per kWh for power, and 3d. per kWh for heating. The cost of the scheme was approximately £16,000.

Scarborough.—LOAN SANCTIONED.—The Town Council has received sanction to the borrowing of £12,500 for mains and services, and £2,500 for meters.

Sheffield.—MAINS EXTENSIONS.—The Corporation Electricity Committee has authorised mains extensions at a cost of £7,682.

INAUGURATION OF NEW PLANT.—The new 15,000-h.p. turbo-alternator at the Neepsend power station was formally set in motion by the Lord Mayor on February 1st. The new set supersedes plant of 12,000 h.p., and the cost was approximately £28,000.

LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to loan of £1,084 for the erection of a sub-station in Exchange Street.

Shipley (Yorks.).—NEW ELECTRICITY CHARGE.—The Urban District Council has approved a scheme submitted by the Electricity Committee for supplying electricity for lighting and power to combined shop-and-house premises, on the basis of a half-yearly charge of 3s. in the £ of rateable value, plus 1d. per kWh consumed, the charge including meter rent and being subject to cash discount of 2½ per cent. The new scale operates from January 1st.

Skegness.—ILLUMINATION SCHEME.—In the coming season a new scheme of electrical illumination is to be adopted for the orchestral piazza front and buildings, the bandstand and dance floor, and the boating lake and waterfall gardens. For the piazza there will be a special trough equipped with colour screens and trained on the dome of the pavilion. The lighting of the lake will consist of coloured strip lighting attached to rustic concrete columns and arches. Strip lighting will also be fixed among the shrubs on the islands in the lake and on the arches of the bridge, while the waterfall will be illuminated with a series of lamps. The estimated cost of the scheme is £2,170.

South Shields.—LOANS.—The Electricity Committee has recommended to the Town Council that application be made for sanction to loans of £10,000 for installations under the existing wiring scheme, and £10,000 for services.

ELECTRICITY CHARGE.—The Corporation Electricity Committee has recommended that the charge for electricity supply to the Tramways Department be reduced from 1¾d. to 1½d. per kWh from February 1st.

Special Orders.—Application has been made to the Electricity Commissioners by Louth Corporation for a Special Order authorising it to supply electricity in the borough.

The Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Urban District Council of Portland to supply electricity in the urban district; the Leicestershire and Warwickshire Electric Power Co., to supply within parts of the rural districts of Ashby-de-la-Zouch, Barrow-upon-Soar, Blaby, Loughborough, and Market Bosworth; and the Boston and District trict Electric Supply Co., Ltd., to supply in the urban districts of Long Sutton and Sutton Bridge, the rural district of East Elloe, and part of the rural district of Boston.

United States. — HYDRO-ELECTRIC DEVELOPMENT. — The Pacific Gas and Electric Company has applied to the Federal Power Commission for a preliminary permit covering a project calling for eight power houses on the Middle and South Forks of Feather River near Quincy and Oroville, Calif. The company plans to construct four storage reservoirs with 252,000 acre-feet of storage on the Middle Fork. One storage reservoir of 108,000 acre-feet capacity is proposed for the South Fork. The project includes the erection of five dams. One is to be 370 ft., another 175 ft., another 108 ft., the fourth 50 ft., and the fifth 20 ft. high. There are to be eight power houses, in which it is proposed to install plant with a total capacity of 360,000 h.p.

Financial plans for the construction of the Saluda Dam, one of the largest hydro-electric projects in the United States, have just been arranged by the Lexington Water Power Company, a subsidiary of the General Gas & Electric Corporation. Great interest has been focused upon this huge development. The dam to be constructed will have the largest cubical content of any dam in the country and the lake will be the largest artificially created in the country. The capacity of the power house, from the standpoint of average normal kWh output, will be exceeded by only one hydro-electric generating station in America, that of the Niagara Falls Power Company. The cost of the development is expected to be approximately $21,000,000. Provision for the disposal of the huge amount of power which will be available has already been made. Contracts extending until 1980 have been consummated with Carolina Power & Light Company, Duke Power Company, and Broad River Power Company.

Wimbledon.—NEW SUB-STATIONS.—The Corporation Electricity Committee is to provide 13 new sub-stations and three transformer kiosks and enlarge four sub-stations, at an estimated cost of £21,000.

NEW MAINS.—The Committee is also to lay new h.p. mains to link up sub-stations, at an estimated cost of £17,500.

York.—LOAN.—The Corporation Electricity Committee has recommended that application be made for sanction to a loan of £14,716 for h.p. cables and switchgear.

Tramway and Railway Notes.

Birmingham.—NEW CARS.—The Corporation Tramways Committee has decided to obtain 50 new tramcars, at an estimated cost of £125,000.

Bolton.—TRACK RENEWALS.—The Corporation Tramways Committee has decided to relay the tramway track on parts of the Tonge Moor route.

Bradford.—NEW SUB-STATION.—The Corporation Estimates Sub-Committee has approved the Electricity Committee's scheme for a traction sub-station at Dudley, at an estimated cost of £8,240.

Continental.—SWITZERLAND.—In an attempt to reduce the running expenses on the Swiss Federal Railways, a proposal has been put forward to use one-man locomotives on the electrified lines. This step has been under consideration for a long time, and as so far there have been no accidents or disturbances at the trials of the new system, it is considered that the driving of passenger trains, as well as goods trains, by one man is satisfactory. The trials are, however, being continued, and no definite conclusions will be drawn until these are completed.

Dudley.—TRANSPORT SCHEME.—The *Electric Railway and Tramway Journal* states that negotiations are now proceeding between the Town Council, the Stourbridge Tramways Co., and the Midland Red Omnibus Co. with a view to arriving at an agreement with reference to a scheme which has for its object the substitution of a comprehensive motor-omnibus system for the present tramway service, which is rapidly becoming obsolete, and the introduction eventually of a profit-sharing enterprise in which the Corporation would participate.

Gloucester.—RAILLESS CARS.—A poll of the citizens which had been demanded on the subject of the Parliamentary Bill being promoted by the Corporation took place on February 2nd. The proposed Bill, which has aroused a good deal of discussion, seeks to empower the Corporation to provide and work railless cars and omnibuses where necessary in place of the existing tramway in certain districts as well as in the city. According to the *Birmingham Post*, the result of the poll was declared as follows:—For the Bill, 4,252; against, 974.

Hastings.—RAILLESS CARS.—It is reported that the Minister of Transport has consented to the Hastings Tramway Co. introducing open-top double-deck railless cars on one route, but has stipulated that single-deck railless cars are to be used on other routes.

Mexborough.—RAILLESS CARS.—Messrs. Richard Garrett and Sons, Ltd., have recently completed a fleet of six 32-seater single-deck railless cars for the Mexborough and Swinton Tramways Co. The chassis of the new vehicles are of the company's standard four-wheeled type equipped with a 50-h.p. Bull motor, a drum-type controller and four wheel brakes. The bodywork is of composite steel-framed construction.

Southern Railway Electrification.—The electrification of the central and part of the eastern sections of the Southern Railway suburban area is now nearing completion, and the first stage will be opened in March, followed in June by a further stage. The third portion will be opened early in 1929. According to *The Times*, the first stage is the service on the Caterham and Tadworth branches *via* Purley to London. Warning of probable delay due to reorganisation in connection with the work is given in a statement issued by the Southern Railway, which says that:—At the present time a number of essential rearrangements are being made in the lines, especially in the Central London area, and these are causing some delay to the business trains. A large number of steam train carriages have been, and are being, withdrawn from service for conversion to electric stock.

Stoke-on-Trent.—ABANDONMENT OF TRAMWAY.—At a meeting of the Corporation on February 1st, a draft agreement with the Potteries Electric Traction Co. for the abandonment of the company's tramway service was approved. According to the *Birmingham Post*, the agreement provides for the surrender of all the company's statutory rights, and the removal of the tramway poles and other overhead equipment, and also making good of the whole of the roadway, where disturbed, to the satisfaction of the city surveyor, within six months from the discontinuance of the tramway service. It was explained that the company will not necessarily take up the rails, but will leave them to be dealt with by the Corporation when future repairs to roads are made. As the price of the surrender of their statutory rights and of their tramway undertaking, the Corporation gives the company 50 additional motor-omnibus permits to run over the abandoned tramway routes. There has been some dispute between the company and the Corporation as to the allocation of the permits, and the agreement provides that if the parties cannot agree upon the hours during which the permits shall be operative, the matter shall be referred to the Minister of Transport, whose decision shall be final.

Worcester.—ABANDONMENT OF TRAMWAY.—The tramways will cease operation on May 1st and a motor-omnibus service will be introduced.

Telegraph and Telephone Notes.

Australia.—"BEAM" RADIO-TELEGRAPHY.—At the annual meeting of Amalgamated Wireless (Australasia), Ltd., Sir George Mason Allard, chairman of directors, said: "While the profits from the 'beam' service are not of anything like the exaggerated proportions that have been reported, I hope that the results of the full year's working will be found satisfactory. Difficulties at the Canadian end have caused delay in the opening of the Canadian 'beam' circuit, but the difficulties are now being overcome, and the opening of the service is expected in the near future."

France.—TRANSATLANTIC TELEPHONY.—Paris and other French towns will shortly be connected with America by wireless telephone *via* the Rugby station in England. Communication as far as Rugby will be by the ordinary cables, then by wireless to Houlton (Maine), and thence by cable to New York. The fee for a three minutes' call will, it is reported, be about 2,000 fr. (approximately £16).—*Reuter* (Paris).

Imperial Communication.—LONDON CONFERENCE.—The Imperial Wireless and Cable Conference, which is sitting in London and considering telegraph communication services within the Empire, has been joined by Mr. R. J. Cremins as the representative of the Irish Free State.

Portugal.—TELEPHONE CONCESSION.—The Government of Portugal, on January 25th, ratified a contract granting a new concession to the Anglo-Portuguese Telephone Co., Ltd., for the operation of the public telephone services in the Lisbon and Oporto City areas. The concession now covers a period of 40 years, and provision has been made for possible extension for a further period of 25 years. The concession terms are equitable and contain benefits both to the Government and the public, and enable the company to meet the demands for the rapid development of the telephone system in the company's areas.—*Reuter.*

Radio Notes.

Austria.—NEW LINZ STATION.—Owing to bad weather, the construction of the new Linz station has been seriously interrupted, through the subsidence of some of the walls upon which an additional storey was being erected. The apparatus for the new station has arrived from London, and it is hoped, says *World Radio*, that the station will be ready for work by the middle of March.

ROSENHUEGEL'S INCREASED POWER.—The transformation of the Rosenhügel station to a working capacity of 60 kW, and a nominal capacity of 200 kW, is proceeding rapidly, and in a few weeks all will be ready. During the last few days of the change over it will be necessary for the Stubenring station to do all the work.

France.—PRIVATE BROADCASTING BAN.—The enforcement of a Decree Law which prohibits broadcasting by any private station has been modified, says the *Daily Telegraph*. The decree, signed by the Minister of Commerce in December, 1926, actually came into effect on January 1st, but the broadcasting companies were allowed one month's grace, which expired on February 1st, though in the case of the Radiola Company the period of grace was six months. All the other broadcasting stations were reminded by a Ministerial circular that their activities must cease until a new arrangement for the control of broadcasting had been elaborated. Urgent representations were made to M. Poincaré and to the Minister of Commerce for relaxation of the strict provisions of the decree, pending examination by the Council of Ministers of new proposals for the regulation of broadcasting.

On February 2nd it was announced from the Ministry of Commerce that broadcasting might go on as usual pending further orders, since it had been decided that the matter was one which the Ministry of Commerce was not competent to settle, and must be dealt with by the Council of Ministers, and subsequently by Parliament.

Iceland.—NEW STATION.—Test transmissions started recently on a wave-length of 192 m. from a station erected at Akureyri, on the north coast of Iceland, by Mr. F. L. Hogg, a London engineer. The station has been subscribed for in this country and in the U.S.A., and is under the control of a representative of the Christian Missions In Many Lands. There is also a station at Reykjavik, the capital of Iceland. The new station's call signs are NI (North Iceland) and G2SH.

India.—"PIRACY."—The unsatisfactory financial position of broadcasting in India, which has aroused comment with regard to the extent to which "piracy" is being practised, is ascribed in the latest issue of the Broadcasting Company's organ to the Government's attitude towards "piracy" and also to its omission to take steps to enforce the laws regarding receiving licences. In this connection the Posts and Telegraphs Depart-

ment has recently inaugurated strict supervision of sets in Bombay City, which has revealed that a large percentage of listeners have no licences. While the authorities are reticent, it is understood that steps are being taken to ensure that all listeners in future shall take out licences. A commentary on this is furnished by the fact that over 600 applications for licences were received during three weeks in Bombay City alone, compared with fewer than 2,000 for the whole of British India to the end of October. It is believed that listeners up country are equally lax, and it is urged that dealers should insist on the production of a licence before selling a set.—*Reuter* (Bombay).

South Africa.—SHORT-WAVE RECEPTION.—A chorus of praise has greeted the performance of England's short-wave Empire transmitter (5SW) at Chelmsford, says *World-Radio*. Dr. J. Lunt, of Kenilworth (late member of the Royal Observatory staff, Cape Town, who was in England about a year ago), is acting as the pick-up station for the Cape Town broadcasters, and his co-operation is efficient. Signals fade after ten o'clock, although during the past month it has been noticed that the fading hour is gradually lengthening.

WHAT IS A "PIRATE"?—Cape Town's two radio inspectors have been very busy of late: ten prosecutions have been effected during two months in the Cape Peninsula, and about twenty others are to appear before the magistrates shortly. There are very few real "pirates" (listeners who have never taken out licences), the majority having been fined £2 for failing to renew their licences within 14 days of expiry, or notifying the P.M.G. that a permit is wanted to keep the set without using it.

Sweden.—STATION IMPROVEMENTS.—The Government has authorised the expenditure of kr. 465,000 during the next year on the "reinforcement" of the Gothenburg and Malmoe broadcasting stations.—*Reuter's Trade Service* (Stockholm).

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—March 13th. Postmaster-General's Department. Motor generators. (B.X. 4136.)*
March 20th. Telephone receivers and parts. (B.X. 4135.)*
April 17th. Harbour Trust. Two 3-ton and two 5-ton semi-portal electric cargo cranes. (A.X. 5827.)*
March 14th. Victorian Government Railways. One 2-ton electric overhead travelling crane. (A.X. 5863.)*
BRISBANE.—May 16th. City Electric Light Co., Ltd. Supply of 33,000-V underground cable and submarine cable. (Spec. 148.) Mr. J. S. Just, engineer and manager, Boundary Street, Brisbane.

Belfast.—February 18th. Electricity Department. Materials for 12 months, including cables, electrical accessories, meters, &c. (February 3rd.)

Birmingham.—February 11th. Electric lighting installation at Dudley Road hospital. Particulars from Mr. C. P. Beech, clerk to Board of Guardians, Union Offices, Edmund Street.

Cardiff.—February 24th. Electricity Department. E.h.p. and l.p. cables for 12 months. One 1,250-kW rotary convertor. (February 3rd.)

Darlington.—February 13th. Electricity Department. One water-tube boiler, with mechanical stoker, economiser, air heater, chimney, &c. (January 27th.)

Dundee.—February 16th. Electricity Department. One 100-kVA indoor-type sub-station transformer, 3-core e.h.p. and 4-core l.p. cable. (January 27th.)

Edinburgh.—February 27th. Electricity Supply Department. Four steam-generating units, complete with mechanical stokers, economisers, air heaters, grit arrestors, chimneys, &c.; steam, water and dust extraction pipework and valves; one electrically-driven and two steam-driven boiler feed pumps. (January 20th.)
February 20th. One 1,000-kW motor convertor, three 1,000-kVA transformers, e.h.p. and l.p. switchgear. (February 3rd.)

Edmonton.—February 14th. Urban District Council. Maintenance of the electric lighting installation at the Town Hall and offices, public baths, cleansing station, stores, mortuary and outbuildings, maternity centre, and public libraries, to include the supply of necessary materials, for a period of 12 months. (February 3rd.)

Egypt.—CAIRO.—February 25th. Ministry of the Interior. Pumps, motors, &c., for the water supply works at Luxor. (A.X. 5861.)*
February 28th. Pumps, motors, &c., for the water supply at Keneh. (A.X. 5860.)*

Goole.—February 13th. West Riding Education Committee. Electric light installation, secondary school. Education Department, County Hall, Wakefield.

Gloucester.—February 20th. Electricity Department. Two 3,000-kVA transformers, nineteen 25-kVA ditto h.p. switchgear, &c. (February 3rd.)

Halifax.—March 3rd. Electrician's work required in erection of arcade and shops. Particulars from Borough Engineer, Crossley Street.

Hull.—February 13th. Tramways Committee. General stores for 12 months, including lamps, cable, switches, overhead equipment material, &c. General manager, Tramway Offices, Albion Street.

Ilford.—February 27th. Electricity Department. Two 1,500-kW auto-synchronous motor generators. (See this issue.)

Kirkcaldy.—February 15th. Fife Education Authority. Electric lighting work in connection with the reinstatement of Crosshill school, after fire. Schedules from Mr. George Sandilands, master of works, Education Offices, Kirkcaldy.

Leeds.—February 17th. Electricity Committee. Twelve months' supply of stores, including cables, jointing and insulating materials, &c. (January 27th.)

London.—CENTRAL ELECTRICITY BOARD.—March 6th. 132-kV switchgear for outdoor transforming stations. (January 20th.)
METROPOLITAN ASYLUMS BOARD.—February 22nd. Installation of automatic telephone and call bell systems at the Northern Fever Hospital, Winchmore Hill, N.21, and installation of electric bells at the Hostel, Little Gray's Inn Lane, E.C. (February 3rd.)
HAMMERSMITH.—February 22nd. Electricity Committee. Stores for 12 months (including electric lighting sundries, joint boxes, meters, cables, &c.). (February 3rd.)
CROWN AGENTS FOR THE COLONIES.—February 24th. Supply, installation and maintenance of sub-station plant and switchgear at Colombo, Ceylon. (February 3rd.)
CAMBERWELL.—February 21st. Board of Guardians. Installation of a telephone system at Constance Road Institution, East Dulwich. (February 3rd.)
ST. PANCRAS.—March 3rd. Electricity Department. Two 1,000-kW and one 1,500-kW motor convertors. (See this issue.)
HOLBORN.—February 14th. Borough Council. Twelve months' supply of electric lamps. Specifications from Mr. J. E. Lark, borough surveyor, Town Hall, High Holborn, W.C.1.

Manchester.—February 14th. Tramways Committee. Permanent-way points, tongues, and crossings and general stores, including:—Sched. A: Commutator segments, armature and field coils, switches, bells, cells, &c.; insulation material, overhead equipment material, circuit breakers (tramway type), lightning arrestors, electrodes for welding cable (power and lighting), bell wire. Schedules, &c., from Mr. H. Mattinson, general manager and chief engineer, 55, Piccadilly.
February 22nd. Electricity Committee. Four motor-driven water pumps, &c. (See this issue.)
February 24th. One 9,000-kVA transformer. (See this issue.)
February 28th. Five motor (or rotary) convertors. (See this issue.)

Nantwich.—February 23rd. Board of Guardians. Electric lighting installation for the Institution. Mr. G. P. Dennis, 66, South John Street, Liverpool. (Returnable deposit of £1 1s.)

New Zealand.—WELLINGTON.—March 21st. Post and Telegraph Department. Automatic telephone receivers. (B.X. 4143.)*
May 25th. New Zealand Government Railways. Machine tools and workshop equipment. (A.X. 5823.)*

Oldham.—February 18th. Electricity Department. Steam feed, exhaust, drain and condenser water pipes, boiler-feed pumps, feed and drain tanks, &c. (January 20th.)

Peru.—LIMA.—Flashing traffic beacons. (B.X. 4174.)*

Plymouth. — February 20th. Electricity Department. Electricity meters, cables, transformers, and sub-station switchgear. (January 27th.)

Portuguese East Africa.—LOURENCO MARQUES.—March 26th. Port and Railways Department. Two groups of motor pumps for Ressano Garcia water supply. (A.X. 5831.)*

Rugby.—March 5th. Electricity Department. One 2,000-kVA transformer, with switchgear.

Rumania.—GALATZ.—March 1st. Direction of Maritime Fort Service, Constantza. Four 3-ton semi-portal cranes. (A.X. 5850.)*

Salford.—February 17th. Electricity Department. E.h.p. and l.p. cables. (See this issue.)

South Africa.—JOHANNESBURG.—February 16th. Town Council. Metal filament traction lamps. (B.X. 4160.)*
March 15th. South African Railways and Harbours. Four 25-ton electrically-driven overhead travelling cranes. (A.X. 5883.)*
April 5th. Two electric goods lifts. (A.X. 5873.)*
February 16th. Municipal Council. Street lighting. (B.X. 4179.)*
March 1st. Truck-type cubicles. (B.X. 4180.)*
May 3rd. Postmaster-General's Department. Manual telephone exchange for Hillbrow, Johannesburg.
CAPE TOWN.—March 7th. Electricity Department. Electricity meters. (B.X. 4189.)*
Insulated wire. (B.X. 4191.)*
PRETORIA.—April 5th. Town Council. One 7,500-kW turbo-generator with alternative of one 6,000-kW ditto.

Swindon.—February 11th. Electricity Department. Telpher coal-conveying plant, &c. (January 20th.)

Uruguay.—MONTEVIDEO.—March 19th. State Electricity Works. Equipment for one main transformer station, five sub-transformer stations, two connection posts, and one inspection post with accessories and spares. (B.X. 4173.)*

Waterford.—February 18th. Electricity Supply Department. Three 120-kVA transformers, five 60-kVA ditto. (January 20th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—SYDNEY.—City Council Electricity Department. Accepted:—
Ironclad switchgear (£93,954).—Ferguson, Pailin, Ltd.—*Reuter* (Sydney).

Birkenhead.—Electricity Committee. Accepted:—
Cable.—Liverpool Electric Cable Co., Ltd. (£572); Hackbridge Cable Co., Ltd. (£6,731); W. T. Henley's Telegraph Works Co., Ltd. (£3,154).

Birmingham.—Salvage Committee. Accepted:—
Electric vehicles.—Electricars, Ltd., and General Vehicle Co., Ltd.
Battery for electric vehicle.—Sir Frederick W. Young and Co., Ltd.
Education Committee. Accepted:—
Electric lighting installations:—At Bierton Road school.—Reynolds & Bradwell. At Oozells Street centre.—E. Hill & Sons. At Osler Street school.—Lea, Son and Co., Ltd.

Burton-on-Trent.—Electricity Committee. Accepted:—
1,500-kVA transformer (£678).—Metropolitan-Vickers Electrical Co., Ltd.

Glasgow.—Tramway Committee. Recommended:—
Copper trolley wire.—Felten & Guilleaume.
Block tin.—P. & W. MacLellan, Ltd.

Johnstone.—Town Council. Accepted:—
Electric lighting installation at 160 houses (£770).—J. Cummings & Son.

Lamp Contracts.—The Great Western Railway Co. has placed a contract with Metro-Vick Supplies, Ltd., for "Cosmos" gasfilled lamps. The Government of Northern Ireland has placed a contract for lamps with Edison Swan Electric Co., Ltd.

Leeds.—Electricity Committee. Accepted:—
Cables.—W. T. Henley's Telegraph Works Co., Ltd. (£2,767); Macintosh Cable Co., Ltd. (£2,601); Enfield Cable Works, Ltd. (£832); Hackbridge Cable Co., Ltd. (£1,803).

Liverpool.—Electricity and Tramways Committee.
Structural steelwork for the Lister Drive power station, boiler house extension (£27,530).—Babcock & Wilcox, Ltd.
A.c. motors (various) (£1,140).—English Electric Co., Ltd.
Special trackwork (£582).—Titan Trackwork Co., Ltd.

London.—HACKNEY.—Works Committee. Recommended:—
Battery for electric vehicle (£250).—Chloride Electrical Storage Co., Ltd.
Finance Committee. Recommended:—
One 1,500-kW convertor (£5,520); mid-wire booster and diverter (£183).—Bruce Peebles & Co., Ltd.
METROPOLITAN ASYLUMS BOARD.—Works Committee.
Re-wiring fire-alarm system, Eastern Hospital:—

Bruce & Co.	£111
L. G. Tate & Co., Ltd. (Recommended.) ...	**175**
T. Clarke & Co., Ltd.	271
J. & S. Farr, Ltd.	412
Alpha Mfg. & Electrical Co., Ltd.	430
Toy & Winslow	470

Electric bell installation at Chelsea Casual Ward:—

T. Clarke & Co., Ltd. (Recommended.) ...	**£121**
L. G. Tate & Co., Ltd.	125
Toy & Winslow	157
Riddle & Goddard, Ltd.	165
Uneedus Electrical Co.	179
H.L.P. Installations Co.	189
J. & S. Farr, Ltd.	210
Alpha Mfg. & Electrical Co., Ltd.	213
W. H. Agar	245

BERMONDSEY.—Libraries Committee. Accepted:—
Microphone and loud-speaking apparatus at Central Baths (£200).—A. Lyon & Co.

SOUTHWARK.—Electricity Committee. Accepted:—
One mud drum (£191).—Vickers Boiler Co., Ltd.

LONDON COUNTY COUNCIL.—Education Committee. Accepted:—
Installing electric light at Dalmain Road Schools, Forest Hill (£399).—Mr. J. Briggs.

Reigate.—Town Council. Accepted:—
Refuse destructor plant (£10,678).—Manlove, Alliott & Co., Ltd.

Sheffield.—Electricity Committee. Accepted:—
Two natural draught cooling towers for Neepsend (£6,645).—Davenport Engineering Co., Ltd.

Shipley.—Electricity Committee. Accepted:—
Meters for 12 months.—Landis & Gyr, Ltd.

Stockport.—The Town Council has accepted the tender of Escher Wyss & Co. for a 20,000-kW turbine set at £34,307, comprising a Swiss single-casing turbine, £11,431; British Brown-Boveri alternator, £12,750; Swiss condenser, £8,126; and provisional sum, £2,000. The firm submitted four tenders, the other three amounting respectively to £42,557 (with an English Electric alternator at £21,000), £39,570, and £39,502. The tenders of the British firms ranged from £51,325 to £60,815.

York.—Electricity Committee. Accepted:—
H.p. cables (£1,760).—Callender's Cable & Construction Co., Ltd.

Forthcoming Events.

Junior Institution of Engineers.—Friday, February 10th. 39, Victoria Street, S.W. 7.30 p.m. "Some Principles of Investigation in Engineering Work." Prof. H. P. Philpot.

Lincoln Engineering Society.—Friday, February 10th. Municipal Technical School, Lincoln. 7.30 p.m. "The Romance of Electricity." Mr. A. P. M. Fleming.

Physical Society.—Friday, February 10th. Imperial College of Science, South Kensington, S.W. 5 p.m. Ordinary meeting.

Electrical Engineers' Ball.—Friday, February 10th. Hotel Cecil.

British Electrical and Allied Industries Research Association.—Friday, February 10th. Savoy Hotel. 12.45 p.m. for 1 p.m. Luncheon.

Electrical Trades Commercial Travellers' Association.—Friday, February 10th. Connaught Rooms, London, W.C. Annual dinner.

Electrical Power Engineers' Association (Northern Division).—Saturday February 11th. Midland Hotel, Manchester. 5.30 for 6 p.m. Annual dinner.
(Scottish Division).—Saturday, February 11th. Ferguson and Forrester's Restaurant, Buchanan Street, Glasgow. Annual dinner.

Royal Society of Arts.—Monday, February 13th. John Street, Adelphi, W.C. 8 p.m. Cantor lecture. "Fatigue Phenomena, with Special Reference to Single Crystals." Mr. H. Gough. (Lecture I.)

Nottingham Society of Engineers.—Monday, February 13th. Victoria Station Hotel. 7.30 p.m. "Industrial Steam Accumulation." Mr. T. Nordenson.
Friday, February 17th. Mikado Café. 7.30. Ladies evening.

Institute of Wireless Technology.—Tuesday, February 14th. Engineers' Club. 7 p.m. "Selectivity and the Regional Scheme." Mr. G. L. Morrow.

Institute of Marine Engineers.—Tuesday, February 14th. Institute, 85-88, Minories, E.1. "Corrosion of Iron and Steel, with special reference to Steam Boilers." Mr. G. S. Irving.

Friday, February 17th. 6.30 p.m. Annual general meeting.

Institution of Heating and Ventilating Engineers.—Wednesday, February 15th. Holborn Restaurant, W.C.2. 2.30 p.m. Presidential address. Mr. S. B. Horrocks.

Society of Technical Engineers (London Branch).—Wednesday, February 15th. Engineers' Club, W. 7.45 p.m. "The Application to Engineering of the Dewey System of Decimal Classification." Mr. R. Borlase Matthews.

Electrical Power Engineers' Association.—Wednesday, February 15th. Geographical Hall, Manchester. 7.30 p.m. Meeting in connection with the Technical Groups scheme for the Manchester district.

Institution of Electrical Engineers.—Thursday, February 16th. Institution, London, W.C. 6 p.m. "Modern Electric Wiring, particularly as applied to Small Houses," Mr. D. S Munro; and "The Domestic Applications of Electricity," Messrs. A. J. Milne and R. H. Rawll. The meeting will be preceded by the exhibition of a film illustrating the new Anglo-American telephone service, entitled "Voices Across the Sea."

(North-Eastern Centre).—Monday, February 13th. Armstrong College, Newcastle-on-Tyne. 7 p.m. "Some Practical Considerations in the Design of Automatic Equipments for Heavy Traction Sub-stations." Mr. H. B. Poynder.

Tuesday, February 14th. Central Station Hotel, Newcastle-on-Tyne. 7 p.m. Annual dinner.

(Scottish Centre).—Tuesday, February 14th. Royal Technical College, Glasgow. 7.30 p.m. "Modern Electric Wiring, particularly as applied to Small Houses." Mr. D. S. Munro.

(South-Midland Centre). — Wednesday, February 15th. University, Birmingham. 7 p.m. "Storage Batteries in relation to Modern Supply of Electric Lighting and Power." Mr. E. C. McKinnon.

(Western Centre).—Monday, February 13th. Bristol. "Higher Steam Pressures and their Application to the Steam Turbine." Messrs. A. H. Law and J. P. Chittenden.

(North-Eastern Students' Section).—Friday, February 17th. Armstrong College Section, Newcastle-on-Tyne. 7.15 p.m. "An Attempt to obtain Photographs Recording Simultaneously the Appearance, the Current, and the Voltage of the A.C. Carbon Arc over one complete Cycle." Mr. G. N. Peel.

(North-Western Students' Section).—Saturday, February 18th. University Women's Union, Lime Grove, Manchester. 7 to 11 p.m. Dance.

Royal Institution of Great Britain.—Thursday, February 16th. 21, Albemarle Street, W. 5.15 p.m. "From Faraday's Note Books." Sir Wm. Bragg, F.R.S.

British Electrical Development Association.—Friday, February 17th. Royal Society of Arts, John Street, Adelphi, W.C. 7.30 p.m. "Selling Refrigeration for Domestic and Small Business Uses." Mr. A. H. Hunter.

Institution of Mechanical Engineers.—Friday, February 17th. Institution, Storey's Gate, S.W. 6 p.m. Annual general meeting. "Waste Heat Recovery." Major W. Gregson.

Meter Engineers' Technical Association.—Friday, February 17th. E.L.M.A. Lighting Service Bureau, London, W.C. 7 p.m. "Metering Rectifier Losses." Mr. R. G. Isaacs.

Association of Mining Electrical Engineers (Western District Sub-Branch).—Saturday, February 18th. Wind Street, Swansea. "A Comparison between Power Supplied in Bulk and Private Power Supplied at Collieries." Mr. E. F. Cope.

Association of Supervising Electrical Engineers.—Saturday, February 18th. Holborn Restaurant. Annual dinner.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

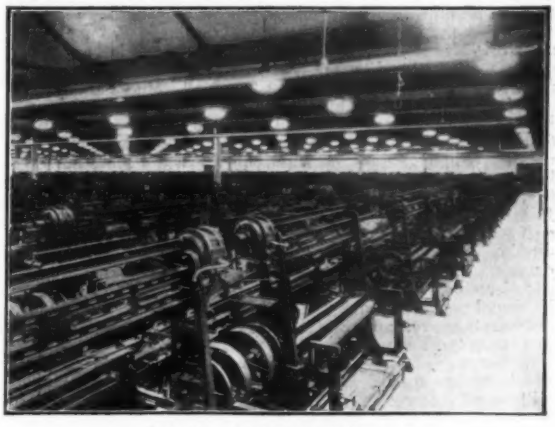
We should be glad to learn the names and addresses of makers of the following:—

Electric pokers for poker work.

Notes.

An Efficient Mill-lighting Installation.

That efficient lighting means increased production is a fact which should be realised by every mill owner and manager throughout the country, and yet, at the present time, the lighting of our mills, as a whole, is of a decidedly poor standard. On the other hand, one finds quite a number of mills equipped with the most efficient lighting systems that modern lighting engineers have been able to devise; the accompanying illustration, which is from an untouched night photograph, is an example. In the shed there are nearly 400 looms, every one of which is adequately and uniformly illuminated. The lighting installation, which was designed by the lighting engineers of the British Thomson-Houston Co., Ltd., consists of



Interior of Weaving Mill.

"Mazdalux" reflectors of the focusing pattern, in conjunction with "Mazda" gasfilled lamps. The units are arranged symmetrically in lines running parallel with the looms and are so placed that the cloth being woven on each loom receives intensive illumination from two units, supplemented by diffused light from at least half-a-dozen other adjacent units. The scheme ensures very uniform illumination and, owing to the number of different sources of light, shadows are almost imperceptible. The additional running cost of up-to-date lighting is negligible in comparison with the benefits secured in the way of greater output and better working conditions.

Educational.

EAST LONDON COLLEGE, ELECTRICAL ENGINEERING DEPARTMENT.—A course of of six lectures on "Atmospherics" by Mr. R. A. Watson Watt, will be delivered on Mondays at 6 p.m., commencing February 13th. Fee for the course, 10s. 6d. (See our advertisement pages to-day.)

The annual examinations of Faraday House Electrical Engineering College for a Faraday scholarship of fifty guineas per annum, tenable for two years in college and one year in manufacturing works, and for a Maxwell scholarship of fifty guineas per annum, tenable for one year in college and one year in works, will be held at Faraday House on April 3rd, 4th and 5th, 1928. Exhibitions may also be awarded to candidates who acquit themselves creditably in the above examinations, but who do not obtain the necessary number of marks to qualify for the Faraday or Maxwell scholarships. Particulars may be obtained from the Registrar, 62-70, Southampton Row, W.C.1.

Legal.

THE ATTORNEY-GENERAL *v.* BIRKENHEAD CORPORATION.

IN the action of Stafford *v.* the Birkenhead Corporation, reported in our issue of December 9th, 1927 (p. 1017), the plaintiff, an electrician employed by the Corporation, obtained damages for wrongful dismissal on account of his not being a member of the Electrical Trades Union. The judge did not grant an injunction restraining the Corporation from applying a rule that only members of the E.T.U. should be employed in its Electricity Department, but he gave the plaintiff liberty to apply for one.

The Attorney-General has now instituted proceedings in the Chancery Division. He asks for declarations that resolutions relating to the employment of union members only, adopted by the Corporation, became void upon the passing of the Trade Disputes and Trade Unions Bill last year, and that the Corporation is acting illegally in enforcing this rule.

Shock Accident.

After removing some children out of danger, a woman was injured at Usworth (Durham) on Saturday, January 28th, in handling a fallen electric wire. She was trying to throw the wire into a field when the current was turned on at the power station Her cries were heard by a neighbour, who succeeded in pulling her out of danger. A doctor was sent for, and the woman was found to be suffering from severe burns and shock.

Power Producers' Congress.

The Biennial Congress of the Union Internationale des Producteurs et Distributeurs d'Energie Electrique is to take place in Paris from July 5th to 10th. The programme for discussion is of considerable interest. Among the subjects to be dealt with are: Recent progress in the construction of large power stations; the question of flue dust; the earthing of the neutral in both high- and low-voltage systems; the control of house installations by supply authorities; the limits of voltage in cables and in aerial lines; the use of 220 volts for supply, and also of systems with 30 volts on consumers' premises; supply tariffs and the question of power factor; propaganda among customers; accumulator vehicles; legislation and international statistics. In view of the way in which statistics may be juggled by interested parties, this last subject is of material importance. The Union was formed to enable power supply authorities, both company and municipal, to meet together to discuss their problems and difficulties, and to have a central clearing house for information on technical and allied matters. It might be said that in the matter of such organisations and their congresses there is a certain amount of overlapping, but the progress that is taking place is so rapid that discussions must be of all-round benefit.

It is strange that, while a number of power undertakings in many countries are interested in the activities of the Union, Great Britain is so far unrepresented. Some people have said that the language question stands in the way; that, however, has not prevented the largest organisation in the United States from joining up, Mr. John W. Lieb, of the New York Edison Company, being an active supporter. Power supply authorities form, so to speak, the members, such authorities sending their engineers or managers as delegates to the congresses. The papers are written from the point of view of the supplier of power, and therefore systems are discussed in an impartial manner, and papers by persons directly interested in manufacture, &c., are not dealt with. To the congress at Rome in 1926 several Governments sent official representatives; now that our Government has officially recognised the existence of electricity supply as a factor of national importance, it will be of interest to see whether any notice will be taken of this congress.

The headquarters of the Union is at 26, Rue de la Baume, Paris.

Fatalities.

An inquest was held at Coventry Coroner's Court on Margaret Hall, aged 11 years, who received a fatal electric shock in her bath. It was stated that an electric radiator was standing on a box at the end of the bath, and that deceased in moving it dropped it into the bath. A verdict of "Accidental death" was returned."

Frank Bagshaw, employed at the British Celanese Works at Spondon, near Derby, stepped into a lift, and on making contact to set the lift in operation, received a fatal electric shock at 440 V. At the inquest on February 2nd it was stated that the earth wire had been broken through vibration. The jury, in returning a verdict of "Accidental death," suggested that the earth wire should be inspected more frequently, and that if necessary it should be strengthened.

On Friday last A. E. D. Elkins, aged 22, was killed by electric shock at the Southern Railway power station, Durnsford Road. At the inquest on Tuesday a verdict of "Accidental death" was returned. A report will appear in our next issue.

Air Force Apprenticeships.

The Air Ministry announces that 600 aircraft apprentices, between the ages of 15 and 17, are required by the Royal Air Force for entry into the Schools of Technical Training. They will be enlisted as the result of competitions. Successful candidates will be required to complete a period of 12 (twelve) years' regular Air Force service from the age of 18, in addition to the training period. At the age of 30 they may return to civil life, or may be permitted to re-engage to complete time for pension. The principal trades open to boys are those of metal rigger, a new trade brought into existence by the introduction of the metal aeroplane, which involves training in both fitting and sheet-metal work, fitter (aero engine), and wireless operator-mechaiic. The apprentices are given a thorough training in their trade by highly-qualified technical instructors and their general education is also carried on simultaneously by a staff of graduate teachers. Particulars can be obtained from the Royal Air Force, Gwydyr House, Whitehall, S.W.1.

The Sun-Ray Treatment of Woolcombers.

The January *Industrial Welfare* reproduces a report by the Bradford Corporation Baths Department upon experiments in the application of ultra-violet rays conducted with the aid of six woolcombers. These men were night workers and were all subject to some physical disability such as pleurisy, bronchitis, lumbago, &c. By means of a mercury-vapour quartz lamp exposures of varying duration were given to the subjects extending over a period of from three to four weeks. In every case there was a considerable improvement in the man's health, manifesting itself in different ways. As a result of the tests it is considered that the installation of suitable lamps in mills and factories is justified, and that all night workers should be allowed to have such "sun" baths under the direction of a competent and skilled operator.

E.A.W. Activities.

The 9th branch, Leeds and West Riding, of the Electrical Association for Women was inaugurated at a meeting in the Philosophical Hall, Leeds, on January 27th, over which Mrs. Currer Briggs presided. Mr. W. B. Woodhouse, Yorkshire Electric Power Co., spoke, and referred to the chance the artistic sense of women had of expression in connection with electric lighting.

Miss C. Haslett, director of the Association, said that the organisation now had a membership of over 2,000.

Dr. S. Z. de Ferranti, F.R.S., paid a tribute to the body on its past achievements, and Miss Laura A. Wilson, M.B.E., Halifax, maintained that the bogey of the high cost of electricity would be dispelled if a little "gumption" were used. Among the officials appointed were: Lady Kathleen Pilkington, president; and Mrs. P. B. Ingleby, hon. secretary.

"Electric Sewing Machines" was the subject of a lecture given in connection with the Glasgow Branch of the Association in the Electricity Department's Welfare Hall on February 1st by Mr. W. Greig.

Diesel-Engine Power for Geneva.

The Diesel engine has for some years been popular as a stand-by for power generation, and since the war it has been increasingly used for main generating plant. The latest station to adopt Diesel engines is at Geneva. The steadily increasing demand for electrical energy gives rise, especially in the winter, to considerable peak loads, and the impossibility of obtaining the necessary extra electricity from neighbouring supply companies has induced the Geneva authorities to undertake the conversion and extension of the existing power station, which is equipped with steam turbines. As a result, two four-cylinder two-cycle Sulzer-Diesel engines are to be installed, each with a normal output of 3,000 h.p., at 125 r.p.m., for driving two-phase alternators. The two sets will be installed in place of two old turbo-alternators. The station serves as stand-by to the hydro-electric plant of Chévres, on the Rhone. Other large Swiss towns where Diesel engines have already been adopted for this purpose are Berne and Lugano.

London Electrical Engineers, R.E.

The battalion orders by Lt.-Col. C. H. S. Evans, O.B.E., commanding the 27th A.A. Battalion, R.E., provide for the annual camp to be held this year from August 5th to 19th. About 50 N.C.O.'s and men are required for a camp to be held at Biggin Hill during the Easter holidays.

Appointments Vacant.

Lecturer and teacher in electrical design for the Goldsmiths' College. Armature winding shop foreman (Rs.500 per month) for the Great Indian Peninsula Railway. Electrician-plumber-jointer for the Grays U.D.C. Transmission line engineer (£800 to £900) for Malaya. Two clerks (£153) for the Beckenham U.D.C. Electricity Department. (See our advertisement pages to-day.)

The Electricity Supply Rifle League.

The annual meeting of the above League was held on December 31st last, when it was reported that, financially, the past year had been successful, but the shooting had not been up to standard, and only two "possibles" had been registered. The championship had been again won by Central A, with an average of 577.16, Mr. H. P. Gaze leading the way with an average of 96.3. The final positions for 1927 were:— 1st Division: Central A, for 3,463, against 3,379, points 11; City A, for 2,291, against 2,273, points 5; County, for 1,694, against 1,709, points 2; Shoreditch, for 2,768, against 2,855, points 0. 2nd Division: B. & K., for 5,139, against 4,884, points 18; St. James', for 5,044, against 4,851, points 14; Central B, for 4.419, against 4,410, points 6; City B. for 5.548, against 5,425, points 8; K. & K., for 3,238, against 3,166; points 6; Hackney, for 4,907, against 5,559; points 0.

Road Signs and Traffic Signals.

Arising out of the discussion on the above subject at the conference of the Institution of Public Lighting Engineers at Brighton last year, it is proposed to hold a meeting for discussion and demonstration at the E.L.M.A. Lighting Service Bureau, London, on February 21st, at 7.30 p.m. Mr. W. J. Jones, M.Sc., will open the discussion. It is thought that this would be a fitting opportunity to exhibit apparatus relative to the subject, and the loan of signs and models is invited for this purpose. Those who would like to contribute in this manner should communicate with the Hon. Sec. of the Institution, 68, Victoria Street, S.W.1. Apparatus should be delivered to the Lighting Service Bureau, 15, Savoy Street, W.C.2.

Diesel Engine Users' Association.

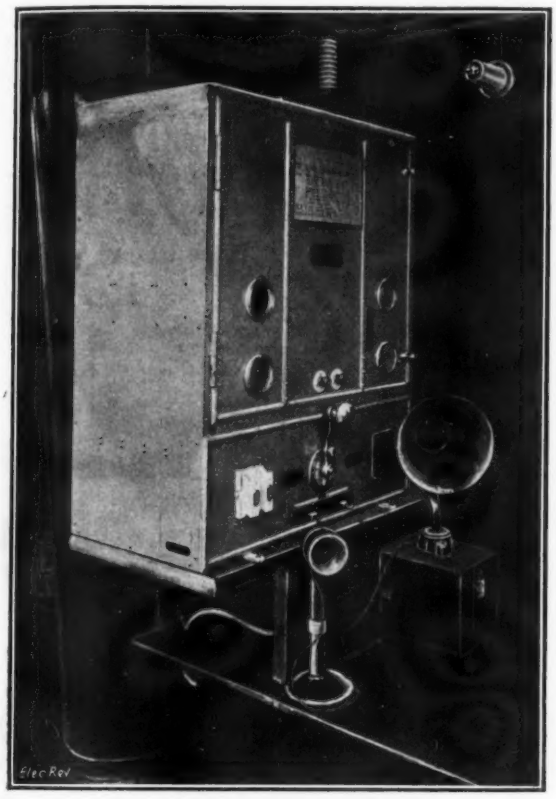
The next meeting of the Association is to be held on Friday, February 24th, to consider a further report on the subject of heavy-oil engine working costs during the year 1926-27. The present report forms the sixth of the annual series.

Electricity Supply to Racing Track.

At a meeting of the Stoke-on-Trent Corporation on January 26th, a recommendation of the Electricity Committee to supply electricity to Northern Greyhound Racers (Hanley), Ltd., was referred back. It was first moved that the recommendation be deleted, but the question was raised of the Corporation's obligation to supply.

A Yacht's Radio Installation.

The motor yacht *Crusader*, owned by Mr. A. K. Macomber, of California, U.S.A., is one of the most elaborately fitted private yachts afloat from the wireless point of view. Nearly every room has its loud-speaker and, not content with receiving from outside sources, Mr. Macomber has arranged to transmit his own programmes from the yacht to his camp whenever he may be ashore; for instance, he is shortly to take part in a big-game hunting expedition on the East



Yacht's Radio-telephone Outfit.

Coast of Africa, and while on shore the hunting party will carry a number of portable receivers which will enable them to pick up telephone conversation and music transmitted from the yacht, which will be anchored off the coast. The vessel is also equipped for the transmission and reception of commercial messages, news, and weather reports: a 1½-kW Marconi valve continuous-wave transmitter and a 1½-kW quenched-spark-gap transmitter enable the ship to keep in communication with commercial stations over long distances; while the ship is capable of receiving messages from all classes of stations. The yacht is also fitted with a Marconi ¼-kW telephone set which is very easily operated and, as will be seen from the accompanying illustration, is entirely self-contained. The handle to be seen in the centre of the bottom panel of the set is used for changing over from transmission to reception, whilst the two small knobs above the handle are for finely adjusting the receiver. Transmission is effected by means of the microphone shown in the foreground, and reception is checked by means of the Brown loud-speaker.

A Power-Factor Table.

We have received from Mr. H. C. Lamb, M.I.E.E., chief engineer and manager of the Manchester Corporation Electricity Department, a table which has been compiled for use in the Department, giving the percentage values of the power factors for different ratios of the lagging-phase to leading-phase readings from −0.99 to 0.99, in steps of 0.01. The decimal increases (for 0.001) are also given for the power-factor values. It is suggested that the arrangement might prove of wider interest, and copies of the tables can be supplied at the rate of 5d. each, or 3s. per dozen, post free.

Institution of Engineering Inspection (Inc.).

The annual dinner will be held on Monday, March 26th, at the Hotel Cecil. There will be a reception by the President at 7 p.m.

Finsbury Technical College Old Students' Association.

The sixteenth annual dinner of the Association will be held at the Engineers' Club on Friday, March 2nd. Tickets (9s. each) may be obtained from Mr. H. P. Guy, Hadley, Station Road, New Barnet, Herts. Any old student will be welcomed, and ladies are invited.

Ex-British Westinghouse Association.

The tenth anniversary of this Association is being celebrated at the Hotel Cecil on March 2nd. Tickets (15s. each, including the year's subscription) can be obtained from the hon. treasurer, 40, Mildred Avenue, Watfor...

Electricity in Rural Life.

At a conference on "Agriculture and the Small Farmer," jointly convened by the Rural Reconstruction Association and the Distributist League, which was held on February 4th at the London School of Economics, Mr. R. Borlase Matthews, M.I.E.E., read a paper on "Electricity in Rural Life," in which he made special reference to the problems of the small farmer. A case for the electrification of a seventy-acre farm was worked out, and it was estimated that electric lighting would save £1 5s., electric milking £11 13s., cream separating £5 16s., water pumping £6 8s. 4d., and an electrically operated chaff cutter £1 11s. 6d., per annum.

The Manchester Electro-Harmonic Society.

The Society held its "Ladies' Evening" on Saturday, January 28th, when a large company enjoyed a well-organised entertainment. Although this is the first function to which ladies have been invited, it is safe to presume that the unqualified success achieved in this instance will result in making such an evening an annual feature of the Society's proceedings.

The President, Mr. J. A. Robertson, welcomed about 230 guests in the spacious "Manchester Limited" Restaurant, where an excellent dinner was served. After dinner a carnival effect was arranged, all present being provided with carnival novelties, and the ladies with fans. Dancing interlarded with a musical programme occupied the remainder of the evening, and the social atmosphere which generally characterises the Society's meetings was well in evidence.

Miss Agnes Clarke (soprano) delighted the company with her beautiful singing, and Mr. Marryat Hudson (entertainer) provided humorous interludes. "The Limited Metronomics" dance band provided selections during dinner and an attractive programme of dance tunes. Messrs. L. A. O'Brien and Wm. Knowles were very active M.C.'s, and organised a well-sustained programme. Thanks were due also to the Organising Sub-Committee, the music secretary, Mr. H. R. Taylor, and Mr. C. E. Leak, the enthusiastic hon. secretary, for the excellence of the arrangements.

Institution Notes.

The Institute of Metals.

The twentieth annual general meeting of the Institute will be held in London on March 7th and 8th next, when the new president, Dr. W. Rosenhain, F.R.S., will be inducted into the chair by Sir John Dewrance, K.B.E., and will deliver his presidential address. Afterwards 16 papers will be read and discussed. They will include "The Thermal and Electrical Conductivity of some Aluminium Alloys and Bronzes," by Messrs. Ezer Griffiths, D.Sc., and F. H. Schofield, B.A., "The Deterioration of Lead Cable Sheathing by Cracking, and its Prevention," by Messrs. S. Beckinsale, B.Sc., and H. Waterhouse, M.Met., and other contributions from leading metallurgists from various countries. Following the papers there will be a dinner and dance at the Trocadero Restaurant on March 7th, and the formal opening of the new offices and library of the Institute on March 8th. The official programme of the meeting includes a notable list of new members—123 in all—which brings the membership close to the 2,000 mark.

Institution of Electrical Engineers.

An exchange of greetings by wireless telephony between the presidents of the Institution of Electrical Engineers and the American Institute of Electrical Engineers will take place on Thursday, February 16th, at 3.30 p.m.

The message from America will be received in the Council Room of the Institution, but arrangements are being made for a repetition of the message in the Lecture Theatre by means of a loud-speaker. Members are invited to hear the message in the Lecture Theatre.

Immediately after the exchange of greetings, a kinematograph film, lasting about fifteen minutes, and illustrating the new Anglo-American telephone service, entitled "Voices Across the Sea," will be exhibited in the Lecture Theatre. This will be repeated at 6 p.m. before the ordinary meeting and discussion.

Institution of Railway Signal Engineers.

The annual general meeting of the above Institution was to be held on February 8th. The agenda included the nomination of Mr. William Stephen Every as the new president. The total membership at January 1st last was 712, an increase of 64 on the figure for the previous year. The income for the year was £928, which represents a surplus over the expenditure of £135.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

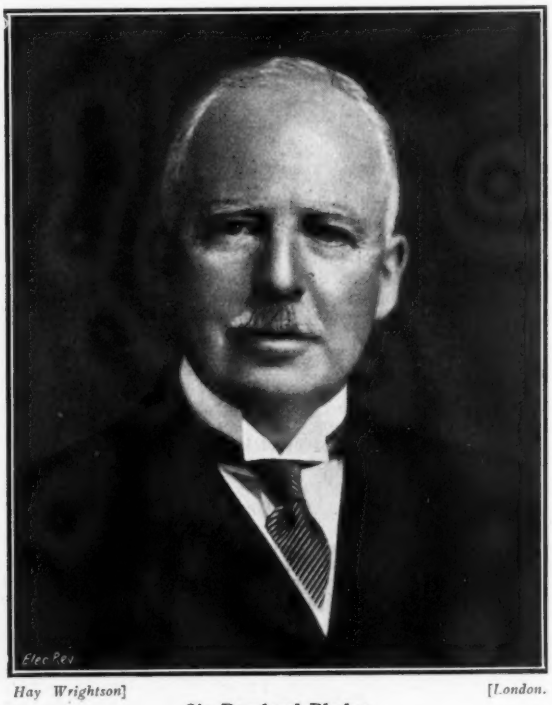
On January 14th the wedding took place, at Kalk Bay (S.A.), of Mr. EWART IVEY, A.M.I.C.E., assistant construction engineer of the Cape Town Corporation Electricity Department, and late of Messrs. Merz & McLellan, and the British Thomson-Houston Co., Ltd., to Miss B. K. LONG, a niece of Mr. Walter F. Long, M.I.E.E., the manager of the Cape Town Tramway Company. At the wedding and reception there were present several notable electrical engineers, including Mr. G. H. Swingler, city electrical engineer of Cape Town, Mr. W. F. Long, Mr. Talton, also of the Cape Town Corporation, Mr. H. G. Smith, of the Electricity Supply Commission, Mr. Archie Simpson, of the English Electric Co., Ltd., and Mr. F. N. Prangnell, of Messrs. A. Reyrolle & Co., Ltd.

At a gathering of the staff and employés of the Stockport electrical undertaking, held at the White Lion Hotel, Stockport, on January 30th, Mr. ROBERT H. LEE, until recently assistant electrical engineer at Stockport, and now electrical engineer at St. Helens, was presented with a writing bureau and a wallet containing Treasury notes, and he also received a dinner wagon for Mrs. Lee. The presentation was made by Mr. R. Lomax, the electrical engineer.

Mr. WALTER D. HIDE, A.M.I.Mech.E., has now resigned from Messrs. Vickers, Ltd., and has joined the staff of Messrs. C. F. Mackness, consulting engineers, 28, Victoria Street, S.W.1

The Tunbridge Wells Town Council has appointed Mr. E. WOOLGAR, charge engineer, as power station superintendent, with an increase in salary to £324. Mr. J. HOLLINGSHEAD, a member of the staff, has been appointed outside maintenance superintendent.

Sir ROWLAND BLADES, Bart., G.B.E., who in November last completed a brilliant year as Lord Mayor of London, and is the head of the famous firm of Blades, East & Blades, printers, founded more than a century ago by his grandfather, has been nominated for the presidency of the Federation of British Industries. Sir Rowland, who was born in 1868, has to his credit a long record of public service, and we are sure he will fill this new and very important office in connection with organised British industry with knowledge, ability and



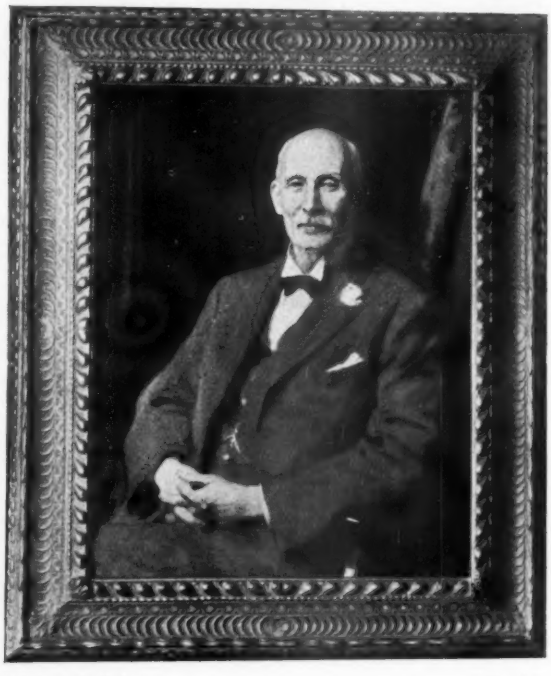
Hay Wrightson] *[London.*

Sir Rowland Blades,

Who has been nominated President of the F.B.I.

distinction. His nomination by the Grand Council took place on Tuesday last week, and it comes before the general meeting of members in March. He follows Lord Gainford, the retiring president, and it will be remembered that previous occupants of the F.B.I. presidential chair have been Colonel Vernon Willey, Sir Eric Geddes, Sir Vincent Caillaid, Sir Peter Rylands, and other well-known men. This will be the first occasion on which a representative of our great printing trades has been president.

At last week's meeting of the Institution of Electrical Engineers a portrait of Mr. LL. B. ATKINSON, past president, was presented to the Institution by Mr. E. Leete, chairman of the Cable Makers' Association. In making the presentation, Mr. Leete said that the portrait (by Mr. George Harcourt, R.A.) had been adopted as a means of expressing the C.M.A.'s appreciation of the services which Mr. Atkinson had rendered to that body and to the electrical industry generally. Then



Wykeham Studios] *[London.*

Mr. Ll. B. Atkinson.

Portrait presented to the I.E.E.

it was thought appropriate, in view of Mr. Atkinson's long association with the Institution, that the portrait should be passed on to accompany the portraits of other past-presidents. Mr. Atkinson expressed his pleasure at the honour which had been done him, and said that the idea of presenting the portrait to the Institution was an admirable one. Mr. A. Page, president, accepted the portrait on behalf of the Institution, and expressed thanks to the donors.

Mr. H. POOL, a member of the Leicester Corporation tramway staff for 27 years, has been appointed from assistant manager to general manager, at £800 a year, rising by £50 to £1,000. Mr. A. F. LUCAS has resigned the position of tramway manager, on a retiring allowance, through ill-health.

On February 6th, Mr. J. H. THOMPSON, engineer and manager of the Colne Electricity and Tramway Department, was installed as W.M. of the Colne Lodge No. 4402, and Mr. Alderman R. S. PILLING, J.P. (chairman of the Colne Electricity Committee) was invested as S.W. of the same Lodge.

Mr. W. A. GILLOTT has resigned his position as branch manager of the St. Helens Cable & Rubber Co., Ltd., at Manchester, to become manager of Modern Electric Homes, Ltd., 50, Oxford Street, London, W.1.

Spalding Urban Council has appointed Mr. FRANK R. ROBERTS, assistant gas and electricity manager, at a salary of £300 a year. Mr. Roberts has for 13 years been assistant district engineer to the Newcastle Electric Supply Co. (Clarence Section).

Mr. J. H. BEAUMONT ROBINS, B.Sc. (Lond.), A.M.I.E.E., was married to Miss WINIFRED MARY REES at All Saints Church, Blackheath, on February 4th. Mr. Robins is with the G.E.C. London (Engineering Department).

The Guildford Town Council has increased the salary of the borough electrical engineer, Mr. W. E. AFFLECK, from £600 to £800 per annum, with annual increments of £100 to £1,000, subject to his remaining for a period of three years.

Lancaster Corporation has appointed Mr. J. H. BRAMLEY, technical assistant, Lincoln Corporation, as assistant electrical engineer.

We learn from Mr. E. MYHRE, A.M.I.E.E., of Metro-Vick Supplies, Ltd., London, and of 35, Glenloch Road, Belsize Park, Hampstead, that he has by deed poll changed his name to Mr. E. KILSBY MUIR as from February 4th.

Mr. A. RAMSAY LAMB, of Chester, district manager for North Wales of the telephone service, who is retiring, has been presented by the surveyors' department of the district with a coffee service. Mr. Lamb entered the service of the National Telephone Co. in 1891.

The Times states that Mr. D. W. HARVEY, general manager of the Toronto Transportation Commission, left Toronto for London on February 3rd. He has been invited by authorities here to confer with them concerning tube and omnibus services.

A financial daily states that Mr. F. A. MACKINNON, the Chief Representative for South America of Sir W. G. Armstrong, Whitworth & Co., Ltd., is sailing for the Argentine on the R.M.S. *Alcantara* on February 15th, for an extended tour in that country, and subsequently in Uruguay and Brazil.

On February 1st a recommendation from the Tramways and Electric Power and Lighting Committee that Mr. P. J. ROBINSON (acting electrical engineer) should be appointed city electrical engineer, came before the Liverpool City Council. With it was coupled a recommendation that Mr. Robinson's salary should be increased from £1,250 to £2,000, rising by £100 per annum to £2,200 per annum. The *Liverpool Post and Mercury* reports that Alderman Wilson (chairman of the Committee) asked the Council to have the matter referred back in consequence of communications which he had received. He declined to give further explanations. The matter was accordingly referred back to the Committee.

At the same meeting there was a proposal to increase the salary of Mr. P. Priestley, general manager of the tramways, from £1,600 to £1,800 per annum, rising subsequently to £2,000 per annum. This was withdrawn on the ground that standing orders had not been complied with.

Dr. THOMAS S. BAKER, president of the Carnegie Institute of Technology in Pittsburgh, U.S.A., who organised the International Conference on Bituminous Coal held at his institution in 1926, sails for Europe to-day, February 10th, and is due to arrive in Paris on February 16th. He will spend about six weeks in several European countries organising the foreign part of the second International Conference on Bituminous Coal which will be held at the Carnegie Institute of Technology in November next.

Obituary.—MR. W. C. MOUNTAIN.—We alluded briefly in our last issue to the death of Mr. W. C. Mountain, which occurred on January 26th, at his residence in Newcastle-on-Tyne. Mr. William Charles Mountain was born in Birmingham in April, 1862. After completing his education at Chiswick, he entered the firm of May & Mountain, general engineers (carrying on business in Birmingham) at the age of 15, serving a full apprenticeship with this firm. During this time he obtained very considerable experience in the manufacture of horizontal steam engines, boilers, rolling mill and other machinery, also capstans and windlasses for the Admiralty. His father disposed of his business in 1882 to Messrs. Harfield & Co., of London, and Mr. W. C. Mountain was offered the management, but declined the offer as he saw a much greater field before him in electrical work. By the influence of Mr. W. F. Batho, consulting engineer, London, he obtained the appointment of engineer, and, later, that of general manager, and, finally, managing director, of the Gulcher Electric Light & Power Co., Ltd., of Battersea. He commenced his duties in January, 1883, and remained five years, during which time he introduced a great many improvements in the mechanical and electrical design of dynamos, motors, and arc lamps. Whilst with this firm he designed the alternators and also the transformers for placing on the poles in the streets for the City of Wellington Electric Light Co., the generators being driven by water turbines supplied by Messrs. Gilbert Gilkes & Co. In January, 1888, he joined Mr. Ernest Scott, of Newcastle-upon-Tyne, as partner, the firm being known as Ernest Scott & Co., and later as Ernest Scott & Mountain, Ltd. The firm at that date manufactured marine engines, Admiralty auxiliary machinery, including pumps, &c. Mr. Mountain introduced the electrical side of the business and designed the dynamos, motors, &c., which the firm manufactured. The chairman of the Cowpen Coal Co. required a section of the North Seaton Pit unwatered by electric power if possible, and the contract for this work was undertaken, the pump being of the three-throw type, of a capacity of 500 gallons per minute against a head of about 100 ft. This plant was most successful, and was the first serious attempt at colliery pumping in the country. Shortly after this the firm supplied the pumping plant for the Victoria Pit of the Lowthian Coal Co., Newbattle, the three pumps having each a capacity of 250 gallons per minute against a head of 700 ft. This was followed by a complete endless rope haulage installation for the Broughton and Plas Power Coal Co., the haulage gear being of the three-wheel type of 200 h.p., and driven from the generators on the surface. This plant was again so successful that the company extended the electrification to its pits at Gatewen and other collieries. From this time the electrical work of the company gradually grew, and as the firm was able to manufacture its own pumps, haulage gears, high-speed engines, &c., it was in an exceptional position. This continued until 1912, by which time the company had become of considerable size, and carried out a very large amount of important work. Mr. Mountain decided in 1912 to resign his position with the company, and he commenced practice as a consulting engineer, and later took his son and son-in-law into partnership, the practice being then carried on in the name of W. C. Mountain, Son & Wood. From that date onwards he had a very considerable practice, and carried out a very large amount of mining work. He acted as electrical expert to the Mining Association of Great Britain in connection with the first set of Electricity in Mines Rules in 1904, and again in 1911, and has been engaged on other matters in connection with the Mining Rules from time to time. He was a member of the Institution of Mechanical Engineers, the Institution of Electrical Engineers, the Institution of Mining Engineers, the Iron and Steel Institute, and the North-East Coast Institution of Engineers and Shipbuilders, and he took an active interest in the formation of the Association of Mining Electrical Engineers. He was a director of various companies. He is survived by his widow and two children, Kenneth A. Mountain and Mrs. W. Wellesley Wood, of Birmingham. The business will now be carried on under the same name by the surviving partners.

PROF. H. A. LORENTZ.—The death took place on February 4th of Prof. H. A. Lorentz, F.R.S., who had occupied the chair of Mathematical Physics at the University of Leyden for almost half a century. He was born at Arnheim, Holland, in 1853, and was granted the degree of Doctor of Philosophy at Leyden in 1875. In collaboration with Prof. Kamerlingh Onnes, and by his own researches, Lorentz conferred upon Leyden University world-wide distinction. His name is constantly met with in treatises on atomic physics, though his work was by no means confined to that subject. Adopting a suggestion of Fitzgerald's, Lorentz developed the electromagnetic theory of light and laid the foundation upon which Einstein raised the theory of relativity, and a highly original and powerful paper which he published in 1904 marked an epoch in the history of physical science. The theory which he and Sir Joseph Larmor worked out revolutionised current views on the behaviour of the electron and the increase of mass accompanying increase of velocity, and he stands in the front rank of atomic and subatomic physicists. Solar physics also claimed his attention, and by his researches on the "Zeeman effect" he discovered that sun-spots were electric cyclones. In 1902, with Zeeman, he was awarded the Nobel Prize for Physics. He was a foreign member of the Royal Society, which awarded him the Rumford and Copley Medals, and he received many other marks of distinction, including the Franklin Gold Medal. In respect of his originality and insight, his breadth of view, and his ability as a teacher, Lorentz was certainly one of the greatest men of science that the world has known.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Small Castings, Ltd.—Private company. Registered January 30th. Capital, £200 in 10s. shares. Objects: To carry on business as electrical and general contractors, metal workers, &c. The first directors are:—A. A. Edwards, 151, Algernon Road, Lewisham, engineer; A. Edwards, 151, Algernon Road, Lewisham. Registered office: 151, Algernon Road, Lewisham, S.E.13.

Sewell & Varley, Ltd.—Private company. Registered January 31st. Capital, £1,500 in £1 shares. Objects: To acquire the business of an electrical engineer and contractor formerly carried on by the late P. F. Sewell, at 23, Lloyd Street, Albert Square, Manchester, as "Sewell & Varley." The first directors are: T. B. Sewell, 17, Charlton Drive, Sale, Ches.; T. Sutton, 11, Etruria Street, Chorlton-on-Medlock. Registered office: 23, Lloyd Street, Manchester.

Power Producers, Ltd.—Private company. Registered January 28th. Capital, £12,500 in £1 shares. Objects: To investigate, develop, promote or assist propositions or schemes for the generation or production of electricity for power, lighting, heating, traction or otherwise in Great Britain or

elsewhere. The subscribers (each with one share) are:—A. Winterbottom, "Mon Abri," Langley Grove, New Malden, company secretary; C. P. Dawes, "Lauderdale," High Road, Felixstowe, company secretary. The first directors (to number not fewer than two or more than seven) are to be appointed by the subscribers. Secretary: C. P. Dawes. Registered office: 14, Waterloo Place, S.W.1.

Neglin Lamp Co., Ltd.—Private company. Registered January 30th. Capital, £500 in £1 shares. Objects: To carry on the business of electrical engineers, contractors, suppliers of electricity, &c. The first directors are:—A. F. H. M. Engelen, van Oldenbarneveldstraat 116a, Rotterdam; J. F. H. C. E. Engelen, Groesbeeksche weg 50, Nijmegen (managing director Neglin Lamp Industrial Co., Ltd., and N.V. Nederlandsche Gloeilampen Industrie "Neglin"). No qualification necessary. Secretary: Kathleen Pope. Registered office: Saffron House, 23, Charterhouse Street, E.C.1.

British Enamelled Wires, Ltd.—Private company. Registered January 28th. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in all kinds of insulated wires and cables, hard and soft rubber goods, and machinery appertaining to same, &c. The first directors are:—C. F. Bill, Farley Hall, Oakamoor; J. Noone, West Street Works, Clayton, Manchester. Solicitors: G. R. Hubbard & Heath, 40, Chancery Lane, W.C.2.

London Fan and Motor Co., Ltd.—Private company. Registered February 3rd. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical fan manufacturers and dealers, wireless and radio apparatus manufacturers and dealers, electricians, &c. The first directors are: G. H. Webber, 24, Glenhurst Avenue, N.W.; Mrs. Emily L. Webber, 24, Glenhurst Avenue, N.W. The said G. H. Webber shall be permanent so long as he holds 250 ordinary shares. Qualification of ordinary directors: 10 ordinary shares. Registered office: 81, Charlotte Street, W.1.

John Drew, Ltd.—Private company. Registered January 27th. Capital, £250 in £1 shares. Objects: To carry on at Blackburn or elsewhere the business of manufacturers of and dealers in electrical fixtures and fittings, electrical and wireless engineers, manufacturers of and dealers in radio apparatus, &c. The first directors are: W. Gill, 7, Magdalene Terrace, Burnley, traveller; R. Robinson, 1, Hargreaves Lane, Blackburn, shuttle maker's labourer. Manager, W. Gill. Registered office: 7, Magdalene Terrace, Burnley.

Official Returns of Electrical Companies.

Community Radio, Ltd.—Mortgage dated December 5th, 1927, to secure £480 and further advances charged on bungalow used as receiving station and engineer's residence at Kiln House Lane, St. Annes-on-the-Sea. Holders: Huddersfield Building Society.

F. C. Brown (Electricity), Ltd.—H. M. James, incorporated accountant, of 14, High Street, Coventry, was appointed receiver and manager on January 12th, 1928, under powers contained in first mortgage debenture dated May 3rd, 1924.

W. Sanders & Co. (1915), Ltd.—Satisfaction to the extent of £800 on January 20th, 1928, of debentures dated December 1st, 1915, securing £1,000.

Cecil Hodges & Co., Ltd.—R. F. Frazer, Bank House, The Broadway, Stratford, E.15, was appointed receiver and manager on January 25th, 1928, under powers contained in debenture dated May 20th, 1926.

Pleno, Ltd.—Satisfaction in full on January 19th, 1928, of mortgage dated April 11th, 1921, securing £150.

Whitfield Electrical Co., Ltd.—J. B. Rubens, of 23, Surrey Street, Strand, W.C.2, was appointed receiver and manager on January 24th, 1928, under powers contained in charge dated August 29th, 1925.

J. L. Maughan & Co., Ltd.—Mortgage dated January 10th, 1928, to secure £1,000, charged on 29, Carliol Street, and 13, Erick Street, Newcastle-upon-Tyne (freehold). Holder: Mrs. S. Maughan, Look Out Farm, Seaton Delaval, Northumberland.

City Notes.

Edmundsons' Electricity Corporation, Ltd.

The shareholders of this company have received a letter signed by the chairman, Mr. P. D. Tuckett, from which the following is extracted:—

"My co-directors and I were recently approached by the Greater London and Counties Trust, Ltd., with a proposal that we should sell our ordinary shares in the company to them, and that the other ordinary shareholders should be asked to do the same. As the result of negotiations, my co-directors and I have agreed to sell the whole of the ordinary shares held by us at the price of £3 10s. per share, and the purchasers have authorised us on their behalf to offer the same price to all the other ordinary shareholders conditional upon the holders of 80 per cent. of such shares, or any smaller number approved by the purchasers, accepting such offer and depositing their share certificates and transfers within sixty days from the date of the agreement, and unless this condition is complied with, the agreement becomes inoperative. This offer, in our opinion, represents a high price for the shares, notwithstanding the present strong financial position of the company. Payment for the shares is to be made within 15 days of the above condition having been complied with.

"I may remind you that a year ago the ordinary shares in this company were quoted at about £1 7s. 6d. a share, and that as late as December last they were dealt in at or about £2 a share. It is only quite recently that the price has risen to the present figure, and this rise is no doubt due to the recent negotiations. It is a source of gratification to my colleagues and myself that, as the result of many years' strenuous endeavour, we can now submit to you an offer which gives you an opportunity of realising your holdings at a handsome price, and we have no hesitation in advising you to accept it. We are glad to be able to say that the purchasers have undertaken to look after the staffs of the various companies.

"When, on the reconstitution of the board, twenty years ago, my co-directors and I undertook the direction of the company, the position of the ordinary shareholders was precarious in the highest degree, with no prospect of a dividend for many years, and during the long period of stress and anxiety which followed, the directors were called upon to devote a large amount of their time to the business of the company. To afford them an inducement to do so and to undertake the responsibilities involved, the articles of association were altered, so as to entitle them to a percentage of the profits over and above a 5 per cent. dividend on the ordinary shares. It is one of the terms of the arrangement that the directors shall agree to the cancellation of this provision, which is now becoming increasingly valuable, and that they shall place their resignations in the hands of the purchasers, and as compensation for so doing they are to receive the sum of £100,000 from the purchasers."

Yorkshire Electric Power Co., Ltd.

The directors' report for the year 1927 shows that the net profit, after payment of interest and debenture stock discount charges, amounted to £294,371, as compared with £257,416 in 1926. To this is added £65,260 brought forward, making available £359,631, which it is proposed to distribute as follows: Preference dividend, £76,944; ordinary dividend of 8 per cent. (of which 3 per cent. has already been paid); to general reserve, £81,000 (making £375,000); to plant renewals fund, £25,000 (making £100,000); leaving £74,095 to be carried forward. The increasing demand for energy was fully maintained during the year, resulting in larger sales and a substantial increase in the net profit. Although in accordance with agreements the prices have been reduced as the price of coal has fallen, resulting in a decrease in the gross revenue, this has had the effect of further stimulating the demand. New agreements continue to be made and the demands from existing customers have increased. The new station at Ferrybridge has been in operation during the year, and the reduced cost of generation, consequent upon the use of larger units, is making itself apparent. The plant, machinery and works have been fully maintained out of revenue. To meet the increasing demands for supply further expenditure is required at the Ferrybridge station, for further extensions at the Thornhill station, and for general extensions to the system. To provide the necessary capital the directors proposed to offer to the shareholders forthwith 897,000 ordinary shares at the price of 24s. each. This will raise the issued ordinary capital to £2,500,000. It is proposed that the basis of allotment shall be 27 per cent. of the number of ordinary or preference shares registered in the name of each holder on February 4th. An extraordinary meeting will follow the annual meeting on February 21st, at which a resolution will be submitted to sanction the issue of £123,000 as ordinary shares, which, with authority previously obtained, will enable the offer of 897,000 shares to be made. The 10,000 preference shares offered to the company's employés have all been taken up, and a resolution is to be submitted providing for the issue of a further 20,000 for the purpose. The report notes that on June 29th last the Royal Assent was given to the company's Act raising the issuable capital from £4,000,000 to £6,000,000, and the borrowing powers from one-third to one-half of the issued capital. A feature of the report is the inclusion of three handsome photogravure views of the company's power stations.

Singapore Traction Co., Ltd.

Several factors operated during the year ended September 30th last to reduce profits considerably. The supply of electricity to the Municipal Commissioners ceased in November, 1926, so that not only was there little profit from that source, but the cost of generating energy for traction purposes was increased. The reconstruction of roads for the purpose of railless traction and the process of changing over interfered temporarily with traffic, and tended to increase the ratio

of operating expenses to revenue. The most serious event, however, was a boycott of the cars by a large section of the Chinese community, which reduced the receipts from $18,000 to $7,000 a week, resulting in a total loss of about $150,000. The operating profit was £13,780. After meeting interest and other charges, the directors propose to write £2,544 off debenture issue expenses and preliminary expenses, to transfer £6,000 to depreciation and renewals account, and to carry forward £2,367. No remuneration for the year is payable to the Shanghai Electric Construction Co., Ltd., as managers of the undertaking. At the date of the accounts the company had 66 trolley 'buses in service on five routes, with an aggregate length of 15¼ miles. The remainder of the full complement of 90 'buses are now either in operation or under construction. Plant for the Mackenzie Road and Keong Saik Road sub-stations was shipped in August last, and the supply to the former from the municipal station is expected to commence this month and to the latter in April. The meeting was to be held on Wednesday last.

Fife Tramway, Light and Power Co., Ltd.

Mr. William Low (chairman), at the annual meeting in Edinburgh, on February 3rd, said there was every indication that the policy adopted of making electricity available in new districts and in encouraging the development of the demand for domestic and general purposes had fully justified itself. As was anticipated, the rapid growth of that department of the business was proving a valuable factor in stabilising and strengthening the combined position in periods of weakness in industrial demand such as they had been experiencing. The number of transforming points on the Power Company's system totalled 157. This represented an average of approximately one distribution centre in every mile of high-pressure line, and illustrated not only the attention which had been given by the directors to the problems of rural electrification, but also the efforts which had been made to meet the requirements of all classes of consumers. During the year the energy sold reached a total of 24,435,000 kWh, an increase of 4,968,000 kWh over the previous year. The load connected to the generating station was now 26,559 kW, an increase of 2,978 kW. The generating station was connected with the adjoining undertaking of the Scottish Electric Power Co. by a main trunk transmission line, and a supply in bulk was being given to that company. The company's report was reviewed in our last issue (p. 205).

Westinghouse Brake & Saxby Signal Co., Ltd.

The annual meeting was held on February 2nd, Lord Southborough presiding. In the course of his speech, the chairman said that although the net profit had decreased during the past year, they had been able to maintain the dividend and transfer £20,000 to reserve. They had spent a great deal of time and money in developing the Westinghouse metal rectifier, for which there were many applications. The company was now manufacturing the rectifier in large quantities, and had granted licences to a number of firms for its use. The net increase of £14,066 in the item "Plant and machinery" was due to the installation of new machinery for producing these rectifiers, and also to the greater use of electricity at their main works, where now practically all of the plant was electrically operated. They had redeemed practically the whole of the outstanding 8 per cent. first mortgage debentures which stood at £307,450 on September 30th last. That relieved the company of a great strain. They had received, in the current financial year, two very important signalling contracts from the Southern Railway and the L.M.S. Railway. The company's success had been very marked, but it was always necessary to preserve a conservative frame of mind and mental outlook.

Stock Exchange Notices.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Fellows Manufacturing.—40,000 deferred ordinary shares of 2s. 6d. each, partly paid and fully paid, Nos. 503,645 to 543,644.

Pinchin, Johnson & Co.—34,000 ordinary shares of £1 each, fully paid, Nos. 645,001 to 679,000.

Adelaide Electric Supply Co., Ltd.—£250,000 new 5½ per cent. consolidated debenture stock.

The undermentioned have been ordered to be officially quoted:—

Constantinople Telephone Co.—£200,000 6 per cent. obligation bonds of £100 each, Nos. X10,001 to X12,000; and £95,436 6 per cent. certificates, Nos. 1 to 3,993 and 4,002 to 4,346, of £22 each (bearer).

Tottenham District Light, Heat and Power Co.

In addition to the dividends on the preference stocks, the directors have declared the following dividends in respect of the half year ended December 31st last:—On the "A" stock, at the rate of 7¾ per cent. per annum (against 5¾ per cent.); on the "B" stock, at the rate of 6¼ per cent. per annum (against 6¼ per cent.).

St. James' and Pall Mall Electric Light Co., Ltd.

The directors recommend balance dividends of 8.4d. per share (3½ per cent.) on the preference shares, and 1s. 0.949d. per share on the ordinary shares, making up the standard dividend for the year.

Traction and General Investment Trust, Ltd.

In his speech at the annual meeting on January 31st, Mr. H. A. Vernet (chairman) said that while the share capital remained the same, the debentures outstanding had been increased to £680,000. Investments at under cost stood at £1,639,615, an increase of £176,000. The valuation shows a surplus over book value of £173,000. The net revenue had increased by £3,178 to £59,980, and the ordinary dividend was 15 per cent. The company's investment in tramway companies only represented 2.25 per cent. of the total, and most of those companies were more interested in the supply of electricity than in tramway operation.

The directors have decided to issue 25,623 £8 shares at the price of £11 5s. each. As from July 1st these will be converted as to £5 per share into preference stock and as to £3 per share into ordinary stock ranking, *pari passu*, with existing stocks.

Dundee, Broughty Ferry and District Tramways Co., Ltd.

The directors announce that the results for the past half-year do not warrant the payment of the interim dividend on the 6 per cent. cumulative preference shares. All possible steps are being taken to improve the business, but with the low fares necessitated by the unregulated traffic conditions, some time must elapse before any substantial improvement occurs.

Stocks and Shares.

MONDAY EVENING.

THE average broker should have had nothing to grumble at in business generally on the Stock Exchange during the last week, although a few jobbers in certain markets, rubbers and oils, for instance, complained that they were starving amidst plenty. The raising of the New York discount rate caused all hope of a drop in our own Bank Rate to disappear, and resulted in a little heaviness and irregularity in both the Gilt Edged and Foreign Bond Markets. The "selective boom" in Industrials is still in full swing, with artificial silk, safety glass and talking machine shares very much in evidence. Elsewhere in the Miscellaneous Market conditions have been irregular, and the voice of caution (badly needed in many places) has been heard through the land. The Rubber Market has been distinctly depressed, and at the moment probably presents favourable opportunities for discriminate buying for lock-up purposes. Home Rails have displayed no decided tendency either way, and the activity in Metropolitan and, to a lesser degree, Districts has been conspicuous by its absence. Undergrounds have also been a little off colour. The dividend is expected on Thursday, and market opinion ranges from 3 per cent. to 4 per cent actual, making, with the interim already paid, between 5 per cent. and 6 per cent. for the year.

Electricity Supply.

Business has again been active in the electricity supply section, with the usual investment demand well in evidence. The report of the Yorkshire Power Company (the first of the bulk supply group to be issued) made its appearance on Friday. Figures show a considerable improvement over the previous year, but the dividend is maintained at 8 per cent. The company are about to issue new ordinary shares at 24s., and propose to offer them to the existing ordinary and preference shareholders on the basis of approximately one new for every four old shares. As the issue price constitutes a distinct bonus, the ordinary shareholders will, not unnaturally, want to know why the preference shares, which carry no participating rights whatever, are to be allowed to participate in what, after all, is part of the ordinary shareholders' equity. The ordinary have hardened to 33s. 6d. Other bulk supply shares which appreciated during the week were Clydes at 32s. 6d., Lancashires at 23s. 6d., Shropshire "A" at 30s., "B" at 29s., Newcastles at 23s. 9d., with the new 23s. 3d. bid, and Midland Counties at 24s. 6d. As regards London companies, Charing Cross and County of London at 26s. 6d. and 30s., respectively, are both 6d. to the good, and Metropolitans have risen sharply to 33s. 6d., a rise of 3s. 6d. Egham and Staines ordinary at 22s. were in demand on dividend prospects. Electric Supply Corporation ordinary at 38s. have put on 3s., and appear to be going better. The Dominion company mentioned in last week's notes as about to make an issue of debenture stock was the Adelaide Electric Supply Company, which, during the week, sold £250,000 5½ per cent. debenture stock. The basis was 99-100, and the stock was all placed in permanent hands in a very few hours. The other concern mentioned was the Hendon Electric Supply Company, which is about to make an issue of 5 per cent. debenture stock round about 97, which, in the first place, will be offered to existing proprietors. There was not quite so much doing in the Foreign and Colonial Section, although Atlas Light and Power ordinary at 20s. were again higher. The preference at 21s. 4½d. were unchanged, with the 6 per cent. debenture stock a point to the good at 104½. Tokio Electric 6 per cent. bonds were a shade off after their big rise of the previous week. East African Power and Lighting ordinary were again in demand, and higher at 26s., with the 7 per cent. preference following suit at 22s. 6d. Burmahs at 24s. 6d. were in inquiry, as were Kalgoorlie Electric 10s. ordinary, which gained the turn at 9s. 3d.

Edmundsons.

The mystery of the persistent upward movement in Edmundsons' Electric £1 ordinary shares is now solved. On Tuesday they moved from their previous night's level of 52s. to 57s., to the accompaniment of rumours that they were to be taken over by the "Yankees" (a somewhat all-embracive term), and the "taking-over" price varied from 55s. to 75s. The next morning it was announced in the Press that an offer would shortly be made for the ordinary shares by the Greater London and Counties Trust, Ltd., no price being then mentioned. It was later announced to be 70s. The Greater London and Counties Trust, Ltd., is a private company which was registered in 1925 as the Greater London Trust, Ltd., to carry on the business of an investment trust company. Its original nominal capital of £10,000 has since increased to £300,000, and a controlling interest is held in the East Anglian Electric Supply Co., Ltd. The present directors are Sir Philip Dawson, William May, and F. Massingberd Rogers, and it is understood in market circles that another well-known name in the electric supply world has since been added to the board. This offer, taking the market somewhat by surprise, has, not unnaturally, caused a considerable amount of speculation as to whether Edmundsons' shareholders are the only ones to be so favoured, or, alternatively, "who's next?" in which connection many names have been mentioned! Urbans (an Edmundson subsidiary) have appreciated to 45s., presumably in sympathy.

Tramways.

The Tramway Market displayed no outstanding feature during the week under review, business, as a whole, being on the quiet side. Both London United Tramways and London Suburban Traction preferences retained their rise of the previous week, and London Suburban ordinaries are now 3s. bid, with the 5s. ordinary share of London United Tramways round about 2s. 6d. The 4 per cent. debenture of the latter company is unchanged at 55½. Quotations for British Electric Traction junior stocks have not altered, although the deferred was dealt in up to 510. Lancashire United Transport ordinary was an active spot, rising at one time to 10s. bid, but finishing a little under the best at 9s. 9d. A good deal of interest was taken in Potteries Electric Traction ordinary and preference on the announcement that an agreement with the Stoke-on-Trent Council has been reached whereby the tramways are to be discontinued and a further 50 motor-buses put on the road in their place. The 5 per cent. cumulative £1 preference shares with four years' arrears of dividend in them have been in active inquiry on the basis of 7s. 6d. to 8s. as a speculative lock-up with possibilities. The ordinary shares are 4s. Turning to the Foreign Section, Anglo-Argentine Trams have been a good market. The 6 per cent. second preference are 1/16 higher, and the 5 per cent. debenture stock at 80 has added another 1½ points to its gain of three during the previous week. British Columbia Electric Railway junior issues were firmer. The preferred is 2½ points to the good, and the deferred gained 3 points, and is now within a point or so of the long-predicted goal of 200. Mexico Tramways are inclined to be sticky, but the 5 per cent. bonds were again marked up, and are now 82. Barcelonas are practically unchanged at 65 x.d., and Brazilian Traction are again off colour at 203. Lisbon Trams were better, and talked somewhat higher at 16s. Whitehall Electric Investments 7½ per cent. preference were a shade up, with the 6 per cent. debenture a point to the good at 105½.

Manufacturing.

Considerable activity was seen in General Electrics, which spurted for no reason that was apparent, and were, at one moment, as high as 38s., from which they subsequently dropped to 36s. 6d., a rise of 1s. 6d. on the week. Another active share was Johnson & Phillips, which at 53s. 9d. is 2s. to the good. These are the only price movements to record in the electrical equipment group. Metropolitan-Vickers and Siemens met with inquiry, and are harder in both cases, whereas English Electric ordinary and preference were inclined to dullness on a little "tired" selling. Edison Swan 4s. ordinary, although only quoted 7/16 and 9/16, were sold up to 12s., at which price the yield on the current dividend is £3 6s. 8d. per cent. The 7½ per cent. preference are now 25s. Westinghouse Brake at 30s. *cum* dividend were 2s. to the good on the encouraging tenor of the chairman's speech at the annual general meeting held during the week, but, rather curiously, Consolidated Signals reacted to 37s. 6d.

Cables.

It is almost redundant to say that Marconis have again been the feature of the Telegraph and Telephone Market. The shares have been extremely active, with American buying in evidence. Prices range between 55s., and just under, to the £3 mark, and the shares closed at 57s. 6d. Much higher prices are spoken of in the near future, and confidence is expressed as to the outcome of the Conference now in being. The convertible debenture stock, after having been 160, reacted to round about 150 on a little end-account profit-taking. Marconi Marines at 38s. 9d., and Canadian Marines at 15s. 6d., are, by comparison with the parent company, inactive and practically unchanged. There was no outstanding feature in the Submarine Cable group, although business was reasonably active. Our list of prices has to record a few fractional losses, and the fact that these all occurred on the last day of the old account would point to the existence of a somewhat weak, albeit probably small, bull account.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend. 1925.	Dividend. 1926.	Price Feb. 6. 1928.	Rise or fall.	Yield. p.c.
	£					
Bournemouth and Poole	1	14†	14†	60/6	—	4 12 10
Brompton Ordinary	1	10	8⅝	25/-	—	5 12 0
Charing Cross Ordinary	1	15	8½	26/6	+6d.	5 5 8
do. do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	8⅝	25/6	—	5 9 10
City of London	1	15	10	30/-	—	4 13 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	32/6	+6d.	4 18 6
County of London	1	15	7½	30/6	+1/-	4 14 0
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	8	10	79/-	+18/-	2 17 2
do. 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	38/-	+3/-	5 15 10
Kensington Ordinary	1	15	8	26/-	—	5 7 8
Lancs. Light and Power	1	7½	7½	27/6	+6d.	5 9 1
London Electric	1	10	8½	25/6	—	5 9 10
do. do. 6% Pref.	5	6	6	5½	—	5 8 2
Metropolitan	1	11	8	33/6	+3/6	4 15 7
do. 4½% Pref.	1	4½	4½	17/-	—	5 8 6
Midland Counties	1	6	6	24/6	+6d.	4 18 0
Newcastle-on-Tyne Ordinary	1	7	5	23/9	—	4 4 8
do. 5% Pref.	1	5	5	18/-	—	5 10 0
do. 7% Pref.	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	10⅜	—	5 11 7
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	5	17½	8	27/-	—	5 3 8
South London	1	15	8½	25/6	—	5 9 10
South Metropolitan Pref.	1	7	7	1¼	—	6 3 0
Urban Ordinary	1	7	7	45/-	+5/-	3 2 3
do. 6% Pref.	1	6	6	1⅛	—	5 13 0
Westminster Ordinary	1	15	8½	25/6	—	5 9 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/9	+1½	6 17 11
Yorkshire Elec.	1	8	8	33/-	—	4 17 0

HOME RAILS.

Central London Ord. Assented	Stock	4	4	74	—	8 1
Metropolitan	,,	5	3	69	—1	4 6 11
do. District	,,	3½	3½	69½	—	4 8 1
Underground Electric	£1	Nil	1½	21/9	—	1 7 7
do. do. Income	Bonds	6	6	109	—	5 10 1

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	99xd	—	6 1 2
do Def.	,,	1½	1½	23½xd	—	6 7 8
Automatic Telephone	1	3	10	48/-	+1/9	4 3 4
Chili Telephone	5	5	6	7⅜	—	3 18 3
Eastern Extension	10	10	10	15½	+½	*6 9 0
Eastern Tel. Ord.	Stock	10	10	147½	—2½	*6 8 10
Globe Tel. and T. Ord.	10	10	10	16	—	*6 5 0
do. do. Pref.	10	6	6	10½	—	5 4 6
Great Northern Tel.	10	20	20	38½	—½	5 3 10
Indo-European	25	8½	10	35	—	*6 1 5
Marconi	10/-	Nil	5	57/6	—	1 14 10
Marconi-Marine	1	7½	8¾	38/9	+1/-	4 10 3
Oriental Telephone Ord.	1	12	12	51/3	—	*4 13 6
United R. Plate Tel.	5	8	8	10½	—	*3 18 1
Western Telegraph	10	10	10	14½	—½	*6 17 11

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref.	5	5½	5½	9⅜	—	7 6 8
do. do. 2nd Pref.	5	6	6	3 1/16	+1/16	7 17 4
do. do. 5% Deb.	Stock	5	5	80	+1½	6 5 0
British Electric Traction Def. Ord.	,,	—	—	500	—	... ...
do. do. 8% Pref. Ord.	,,	7	8	124½	—	6 8 6
Brazil Traction	100	5	6	203 xr	—2	2 19 1
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	93½	—	5 6 11
do. do. Preferred	,,	6¼	6¼	158½	+2½	*3 18 10
do. do. Deferred	,,	8	8	193½	+3	*4 0 8
do. do. Deb.	,,	4½	4½	84½	—	5 0 7
London & Sub. Trac. 5% Pref.	1	Nil	Nil	8/-	—	... ...
London United Tram Deb.	Stock	4	4	55⅝	—	7 4 2
Mexico Trams, 5% Bonds	—	5	5	82	+4	6 4 5
Mexican Light Common	100	Nil	Nil	61	—I	... ...
do. Pref.	100	Nil	Nil	79	—	... ...
do. 1st Bonds	—	5	5	81½	—1	6 5 3
Yorkshire (West Riding)	1	5	—	7/6	—	... ...

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	13	13	64/3	—	4 1 3
British Aluminium Ord.	1	12½	10	50/-	—	4 0 0
British Elec. Transformer Pref.	1	7	7	18/3	—	7 13 6
British Insulated Ord.	1	15	15	4½	—	3 12 8
Brush Ord.	1	10	10	30/-	—	6 13 4
Callenders	1	15	15	8 1/16	—	3 16 4
do. 6½% Pref.	1	6½	6½	23/-	—	5 9 5
Crompton Parkinson Pref. Ord.	1	—	—	17/6	—	... ...
Edison-Swan	4/-	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	89	—	5 12 4
Electric Construction	1	10	7½	25/-	—	6 0 0
Enfield Cable Pref.	1	7½	7½	26/3	—	5 14
English Electric	1	Nil	Nil	9/6	—	... ...
do. do. Pref.	1	6	3	12/6	—	... ...
Gen. Elec. Pref.	1	6½	6½	24/-	—	5 8 4
do. Ord.	1	7½	7½	36/6	+1/6	4 2 2
Henley	1	20	25	5¾	—	4 17 8
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	Nil	13/9	—	... ...
Johnson & Phillips	1	17½	12½	53/9	+2/-	4 12 7
Met.-Vickers Ord.	1	8	8	30/-	—	5 6 8
do. Pref.	2	8	8	2 7/8	—	6 4 8
Siemens Ord.	1	7	7½	30/6	—	4 18 4
Telegraph Construction	12	10	10	23½	—	*4 14 1

* Dividends paid free of Income Tax.
† 4% of which was Tax Free.

Italian Electrical Manufacturing.

Effect of Post-War Expansion upon Imports.

AN interesting and detailed account of the growth and present position of the Italian electrical manufacturing industry has recently been made to the French Government by its Commercial Agent in Italy. The report recalls the fact that a large part of the rapid industrial development which has taken place during the last 35 years, especially in the north of Italy, has been due to the possibility of obtaining, without difficulty, cheap hydraulic power. Although the resources are far from being utilised to the full, the rapid progress of certain industries in a number of districts has brought about such an increasing demand for electricity that it has exceeded the amount available. On the other hand, in other localities, notably the southern districts, electrical energy, which is to a large extent derived from steam-driven stations, is relatively dear and demand tends to remain stationary. The total hydro-electric resources of Italy are estimated at 5,000,000 horse power. In 1915 only just over 1½ million horse-power was utilised, but seven years later 650,000 h.p. more had been installed. There are only between 1,600 and 1,700 communes in Italy which are not supplied with electric power, and 7,600 which are so supplied.

The figures for 1925 showed the following distribution of electric power: Lighting, 9 per cent.; traction, 8 per cent.; electro-chemical and electro-metallurgical industries, 11 per cent.; flour milling, 8 per cent.; other foodstuffs, 8 per cent.; textile, 12 per cent.; mining, 2 per cent.; metallurgical, 9 per cent.; mechanical, 13 per cent.; other, 20 per cent. Of the energy consumed for traction purposes a large part is absorbed by the electrified State railways.

The widespread utilisation of Italy's hydro-electric power has naturally given rise to a demand for machinery and material. This development in its initial stages was undertaken under the auspices of the big German electrical manufacturers; these concerns showed great activity in organising companies for developing hydro-electric power in order to create markets for their manufactures. The entry of Italy into the Great War had the effect not only of eliminating German competition but also of stimulating to a large extent the demand for electrical installations owing to the intense development of industry generally. At the present time Italy is in a position to satisfy her own needs to a great extent and even to maintain a steady export trade which, although at present on a moderate scale, tends to develop.

Italy is, to some extent, handicapped by having to purchase a large proportion of her raw material from abroad. The majority of the electrical manufacturers believe, however, that they are now in a position to supply all the electrical needs of the country while working at their normal capacity. Yet import statistics suggest that Italy is still a fairly important market for foreign material. Since the Armistice, Germany has partly recovered the place which she lost during the War, but she is still far from resuming the position which she occupied before the War.

Side by side with the Italian firms there are branches of important foreign groups which either manufacture or assemble in Italy. These include the Siemens Italian Company, the Tecnomasio Italiano Brown Boveri, the Italian Ganz Company, and the General Electric Co. (America). In addition the Allmanna Svenska A.B. and several French firms operate in the market.

Practically every kind of motor, from the fractional horse power to the high capacity machine, is manufactured in Italy. Alternators up to 15,000 h.p. have been built as well as d.c. generators, transformers of every type and capacity, pumping sets and fans for all uses. There is some import still of special rheostats, variable speed motors, and alternators designed to run at 3,000 r.p.m. for direct coupling to turbines.

The apparatus, the construction of which has not yet been highly developed and for which recourse is still had to foreign suppliers, consists generally of machines with special characteristics, *e.g.*, phase convertors and current transformers. There has also been some importation—notably from the United States—of special high-voltage material. Switchboards, switchgear and power transmission material are made locally in sufficient quantity and variety, although German and American suppliers have, in recent times, provided special distribution boards. Several transmission lines complete with insulators have been erected with material exclusively Italian.

The three-phase locomotives used on the electrified railways capable of hauling 500 tons over the steepest gradients, are made in Italian workshops. It is now difficult for foreign contractors to obtain any orders in connection with railway electrification in the country. Italian electrical material has not yet been standardised to the same extent as in other countries, notably the United States, and it is, therefore, necessary for importers to establish very varied stocks in order to comply with all the different demands of their customers. Measuring instruments are still imported from Germany in spite of the existence of several Italian factories. There is a highly developed output of accumulators which is quite sufficient for the needs of the railway companies and motor vehicle concerns. There is a sufficient local manufacture of cables to answer all requirements and a growing export of certain qualities. Small installation material, although manufactured locally, is largely imported from Germany. There are openings for the sale of domestic appliances, such as vacuum cleaners and washing machines. A cheap article must, however, be offered, so designed that no alteration is necessary in the existing installations. Italy does not yet manufacture sufficient lamps for her own consumption, although there are 20 firms engaged in making them. The principal foreign suppliers are Holland and Germany. At the same time exports are growing.

It should be possible to sell telephone material, in spite of the preference given to the national product, and it is noteworthy that there is a widespread tendency to install the automatic system.

The Import Trade of Siam.

A Comparison of Two Years' Figures.

THE following figures, showing the imports of electrical and allied goods into the port of Bangkok during the year ended March, 1927, are taken from the recently-issued official trade statistics; the figures for the year ended March, 1926, are included for the purposes of comparison, and notes of any increases or decreases are given. Imports stated to be from Singapore and Hong-Kong are for the most part the products of other countries shipped *via* these two ports:—

	1925-26. Ticals. (Thous.)	1926-27. Ticals. (Thous.)	Inc. or dec. Ticals. (Thous.)
Electrical goods and apparatus.—			
Total	819	1,563	+744
From United Kingdom	240	307	+ 67
,, Germany	115	200	+ 85
,, United States	100	139	+ 39
,, Singapore	19	19	—
,, Sweden	22	5	- 17
,, Italy	3	10	+ 7
,, Holland	32	33	+ 1
,, France	42	57	+ 15
,, Japan	102	218	+116
Lamps.—			
Total	575	630	+ 55
From Singapore	51	55	+ 4
,, Hong-Kong	20	6	- 14
,, United Kingdom	65	29	- 36
,, United States	41	7	- 34
,, Japan	103	104	+ 1
,, Germany	250	358	+108
,, Sweden	31	49	+ 18
Scientific instruments and apparatus.—			
Total	283	282	- 1
From United Kingdom	48	47	- 1
,, Germany	87	90	+ 3
,, France	8	13	+ 5
,, Japan	57	65	+ 8
,, United States	30	23	- 7
Prime movers, other than locomotives, marine, military, and agricultural machinery.—			
Total	296	909	+613
From United Kingdom	166	328	+162
,, United States	31	196	+165
,, Germany	51	199	+148
,, Denmark	1	10	+ 9
,, Sweden	27	166	+139
Machinery, unenumerated, including detached parts, and not including agricultural, textile, or sewing machines.—			
Total	717	1,021	+304
From United Kingdom	337	381	+ 44
,, Japan	12	5	- 7
,, United States	105	204	+ 99
,, France	34	31	- 3
,, Denmark	32	20	- 12
,, Germany	131	265	+134
Railway material.—			
Total	877	370	-507
From United Kingdom	47	30	- 17
,, Belgium	75	169	+ 94
,, France	686	33	-653
Cars or trucks for railways or tramways.—			
Total	942	1,205	+263
From United Kingdom	235	495	+260
,, United States	57	61	+ 4
,, Belgium	200	324	+124
Rubber manufactures, other than tires.—			
Total	508	735	+227
From Singapore	392	541	+149
,, United Kingdom	46	99	+ 53
,, United States	23	27	+ 4
,, Japan	7	9	+ 2
,, Germany	20	35	+ 15

NOTE.—Tical=1s. 10½d.

Industrial Electric Heating.

The E.D.A. Exhibition at Bromley-by-Bow.

(*Concluded from page* 211.)

THE exhibit of the ELECTRIC FURNACE CO., LTD., included a large-scale model of a Heroult furnace installation, lent by Messrs. Thos. Firth & Sons, Ltd., of Sheffield, and also a model of the Ajax-Wyatt induction furnace, which was shown working with water in the metal bath to illustrate the operating principle. An air heater for foundry work, tea and rubber drying, and so on, was an interesting feature of this stand. The loading of this is 5 kW, and it will pass 35 cu. ft. of air per min. at about 210 deg. F. Similar machines are made with loadings up to 200 kW. An interesting part of the display was a wide variety of electric-furnace products made in furnaces installed by the company. It is interesting to learn that the company installed the first commercial arc furnace for steel-making, the first induction furnace for brass melting, the first spark-gap-type high-frequency nace, the first motor-generator high-frequency set, the first graphite-electrode factory, and the first amorphous electrode factory in this country. The high-frequency furnace for the manufacture of high-grade tool steel, recently installed in Sheffield, was described fully in the ELECTRICAL REVIEW of December 16th last, p. 1023. Generally the exhibit was intended to show the principles of the various types of furnaces constructed by the company, rather than to demonstrate the furnaces themselves.

Messrs. BRITISH INSULATED CABLES, LTD., showed a 10-kW rivet heater. This is fitted with adjustable heads to take rivets of various lengths up to 6 in. The heater incorporates a transformer with plug-box control, similar to that fitted to the makers' welders, which gives eight different heating speeds, to suit rivets of varying lengths and diameters. The machine is so arranged that it may be easily lifted and moved to any desired position. The current consumption is approximately 1 kWh per 5 to 7 lb. of rivets heated. A spot welder which was also shown is one of a wide range of electric-welding machines made by the company for spot, butt and seam welding. It is intended for single-phase a.c. supply. Interchangeable stakes are supplied in lengths varying from 9 to 24 in. The machines of this type will deal with added thicknesses of mild-steel plates of up to 0.5 in. For 0.2 in. added thickness the consumption is 3 kWh per 1,000 welds. The machine loading is 6 kW.

The METROPOLITAN-VICKERS ELECTRICAL CO., LTD., exhibited two electric ovens representing an extensive range of units suitable for industrial baking, drying and heat-treating processes involving temperatures up to 600 deg. F. One of the exhibits is the largest of the range, the internal dimensions being 5 ft. by 5 ft. by 3 ft. deep; the rating is 20 kW. The ovens are fitted with shelf racks and have adjustable air-inlet shutters underneath the door and a dampered outlet vent in the top of the oven. The heating elements are of heavy-gauge nickel-chromium ribbon supported by porcelain insulators on a steel frame. They are mounted in the oven bottom with protective baffles of expanded or sheet metal. The type K553 20-kW oven, fig. 4, consumes about 18 kWh in attaining a temperature of 400 deg. F., suitable for enamel stoving, and maintains this temperature at a consumption of from 6 to 8 kWh per hour, according to the contents of the oven. Hand or automatic temperature-control gear can be supplied with either type of oven. The extra cost of automatic control is found in practice to be soon recovered in the reduced cost of supervision and power and in the enhanced quality of the product. An important feature is that for oven temperatures of up to 500 deg. F. the heating units operate at black heat only, a condition which results in the life of the elements being greatly extended and the maintenance costs thereby reduced to a negligible amount.

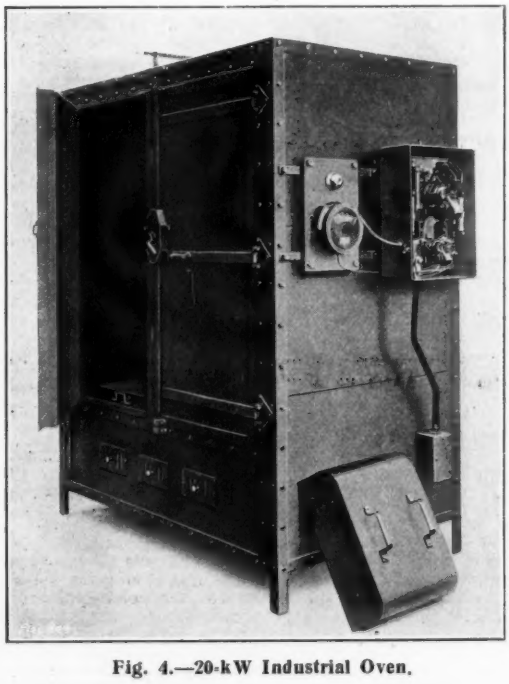


Fig. 4.—20-kW Industrial Oven.

Included in the exhibits of the GENERAL ELECTRIC CO., LTD., was an electric drying oven measuring 4 ft. 6 in. high, 2 ft. 6 in. wide, and 4 ft. deep. The maximum loading is 5 kW. Heating elements are provided at the bottom and sides, and the side heating can be brought into operation according to the nature of the material to be dried. The rate of air flow is regulated by dampers situated in the bottom of the oven, and a suitable outlet is provided in the top. The trays or racks may be staggered so that the air-flow takes a zig-zag path.

An electric japanning oven was also shown on this stand. Its interior dimensions are 6 ft. 8 in. wide by 5 ft. 10 in. deep by 5 ft. 9 in. high, and it has a maximum loading of 25 kW. In actual practice the oven is sunk in the floor to the rail-track level. Heavy articles to be enamelled are loaded on trucks and run into the oven in the ordinary way, while lighter articles may be suspended from the roof, suitable runners being provided. The heating elements are entirely encased in steel tubes, and are thus protected from fumes, and the like. Automatic temperature control is provided within certain limits, and provision is made in the top of the oven for the extraction of the fumes during process.

A 7-kW G.E.C. air heater was also seen. This consists of a bank of elements enclosed in a box-like structure through which air is drawn by an extractor fan and distributed for heating buildings. Other "Magnet" apparatus displayed included a 2-kW, 4-gal wax tank, provided with 3-heat control, an oil pipe heater, and a 4-kW water still. The last-mentioned is arranged to deliver one gallon of distilled water per hour. The water is boiled in the lower part of the vessel and condenses on the under side of the inverted-cone lid from which it drifts into a delivery pipe.

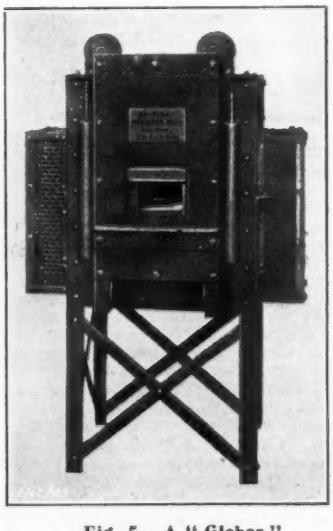


Fig. 5.—A "Globar" Furnace, 6 kVA.

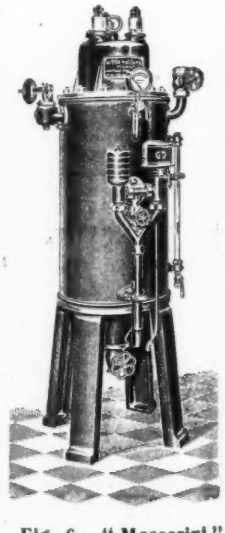


Fig. 6.—"Mascarini" Electro-Steam Boiler.

An interesting exhibit of the BRITISH RESISTOR CO., LTD., was a muffle-type electric furnace fitted with "Globar" non-metallic heating elements, fig. 5. The body is mounted on

an angle-iron stand, 1 ft. 7 in. high, and the internal furnace dimensions are approximately 5½ in. wide by 3½ in. deep by 11½ in. long. The loading is about 6 kVA, and the elements are arranged for operation at 230 volts. The maximum working temperature is from 1,350 to 1,400 deg. C. The furnace is suitable for such purposes as the firing of porcelain and refractory ware and the heat treatment of carbon and alloy steels. The "Crystolon" muffle is easily replaced by the removal of two screws.

Another "Globar" exhibit was the "Uno" electric branding iron, which is claimed to be particularly suitable for branding wood, leather, and so on, or for "browning" the weight on bread. The total weight is 9¾ lb., and the maximum branding dimensions are 7 in. by 3½ in. The loading is 2 kW.

The Bastian Meter Co., Ltd., had an interesting display, which included models of a.c. and d.c. electro-steam boilers, a 30-kW d.c. boiler, an industrial sugar boiler, and a type-cast-pot immersion heater.

The a.c. model is of the "Mascarini" type of boiler, fig. 6, in which the electrodes are immersed in the water direct. Special control is fitted so that the boiler can be left to look after itself. If the pressure rises or the steam demand ceases, the safety arrangements blow down the boiler, thus reducing the current, and finally breaking the circuit.

Heavy Traction Sub-stations.

Some practical considerations of the problems encountered in the design of automatic rotary-convertor equipment which still await satisfactory solution.

By H. B. POYNDER, M.I.E.E.

(*Extracts from paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS.)

APART from the operating advantages of automatic plant, the justification of the additional capital expended thereon depends on the reduction of the cost of staff, which, in turn, depends on the amount of maintenance the gear requires. In the case of main-line railway electrification through open country, the time and expense entailed in travelling to and from sub-stations are generally great, and minor adjustments which are carried out as a part of their regular routine by the attendants in a manual sub-station become serious items of expense in an automatic sub-station. This aspect has not been sufficiently considered in the past, as some present-day designs suggest the assumption that frequent and lengthy visits by the maintenance staff will be a feature of normal operation.

Until comparatively recently few makers succeeded in producing rotary convertors which could be assumed with any degree of certainty to be capable of being switched in after every short circuit, without being first shut down and cleaned. This feature is of paramount importance, for automatic operation would be impracticable without it, and various developments in design which have contributed to improved operating characteristics under short-circuit conditions are being used in various combinations, but high-speed-breaker development has to some extent discounted the importance of such features, as it is probable that a good breaker can make a machine of indifferent design behave fairly satisfactorily; this is, however, no reason for scamping the design of the rotary convertor. Tests seem to indicate the formation of a path of very low-resistance vapour which continues to conduct far beyond the range of incandescence. Similar phenomena occur in switch cubicles, and the phenomenon seems to be of sufficient importance to justify serious scientific research, with a view to determining the laws which govern it. When a heavy short-circuit is applied, flashing occurs at the toe and probably also under the brush. Even under the worst conditions, however, this appears to be comparatively local, the range of incandescence reaching no great distance, but the conducting vapours spread out, and if the flashing is allowed to persist for a sufficient length of time for the vapours to bridge the space between brush arms before the circuit is opened, spontaneous flash-over tends to occur between brush arm and brush arm, when the voltage across the brushes rebuilds on the opening of the circuit by the breaker.

It will thus be seen how important is the element of time, not that it has any particular connection with the time a commutator bar takes to travel from brush to brush, as is sometimes claimed, but because the longer the flashing lasts the greater is the quantity of conducting vapours produced. The total angular displacement of the armature is also a function of the time of persistence of the short-circuit, and the greater the angle the worse are the commutating conditions for a given direct current, and the greater is the alternating synchronising current, so that the flashing grows cumulatively worse the longer it lasts. The advantage of a strong axial draught over the commutator is also apparent.

Circuit Breakers.—The high-speed circuit breaker assists the performance of the machine in two respects. The rise of current is so rapid in the case of a short-circuit in the neighbourhood of the sub-station where there is very little external reactance in circuit that the c.b.'s limitation of the maximum current is not as great as might be expected. The more important feature is that it limits the duration of the flashing, and it is probable that the quantity of vapour produced when operating with a low-speed breaker exceeds that produced when operating with a high-speed breaker by a much larger amount than is suggested by the respective areas of the two curves in fig. 1.

When fitted with an inductive shunt, a high-speed breaker is supposed to be able to clear a short-circuit when the current reached is less than the ordinary overload tripping value, thus discriminating between faults and overloads. The discriminating feature is probably worth having on tramway systems and on dense suburban railway services, where the load has considerable diversity; but on heavy railway work it is practically useless, its only advantage being slightly to accelerate the moment at which the switch first starts to open on a dead short-circuit.

An advantage of high-speed breakers which is perhaps not generally appreciated is that they prevent serious lightning trouble on the track equipment. The breakdowns which occur during thunderstorms are in almost all cases caused by surges set up by lightning strokes in the vicinity of the track which do not actually strike the equipment. The initial discharge, which amounts only to a relatively small number of coulombs, is practically harmless so long as it takes place over the surface of the insulators and does not pierce them, and this can be ensured by proper design of the insulators. The damage results from the great heat generated by the power arc which follows, and the high-speed breaker, by limiting the time

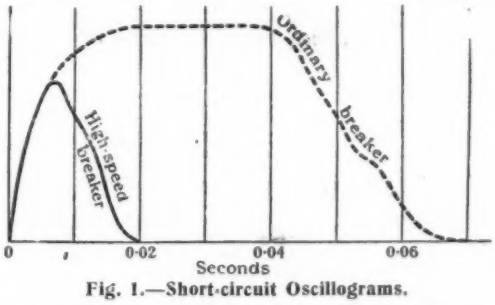


Fig. 1.—Short-circuit Oscillograms.

during which the power arc persists, prevents any damage to the insulators in the great majority of cases. Even when it does occur, it is limited to slight chipping of the insulators, which does not put them out of commission. Other means must, of course, be taken to protect the apparatus in the sub-stations and on the trains from the surges, and it is questionable whether any type of arrestor is more efficient than a metal-sheathed cable some 200 yards long for the positive feed, which converts a large proportion of the energy of the surges into heat.

If the high-speed breaker holding-coils are energised from the track, it is probably undesirable to apply the full-line voltage to them, and a fairly high resistance should therefore be connected in series. Makers should consider the practicability of using for this purpose iron wire in an atmosphere of hydrogen. The characteristics of these resistances are such that an increase of voltage across their terminals of the order of 200 per cent. results in an increase of current of the order of only 10 per cent., and they will have a very powerful stabilising effect upon the holding current, depending upon the ratio of the normal voltage-drops across the resistance and the coil; in the case of a 1,500-volt line, about 1,200 volts should be absorbed by the resistance and 300 volts by the holding coil. Variations in voltage on the line would then be very largely absorbed by the resistance, the voltage across the holding coil remaining nearly constant.

Ventilation.—Means should be taken to provide for the machine being cooled by air which has not previously circulated round the sub-station. The blowing of air axially over the commutator is desirable, and the obvious course therefore is to combine the two by fitting a fan to the back of the armature, the back end of the frame being cased in and cowled with a duct to the basement. Positive ventilation is necessary if the sub-station is to be operated automatically, unless machines are installed which are designed for a higher

ambient temperature and will, therefore, be far too big for their normal operation, and only work at their maximum capacity during the hot season, after the sub-station has been on heavy load for a sufficient number of hours to get heated up to its maximum temperature.

Vertical Machines.—It seems remarkable that no one has developed an overhung vertical machine with a central bearing and a steadying thrust bearing below, the slip-rings and pony motor (if any) being between the two bearings. This would produce a very compact design, the magnet ring resting on the sub-station floor and the slip-rings and pony motor being in the basement. The accumulation of conducting vapour would be impossible, there being in the suggested design a free upward path for all conducting vapours. There would be no pedestal or bedplate to protect with non-conducting material, such as is now required. A machine built on these lines (fig. 2) would appear to be substantially superior to

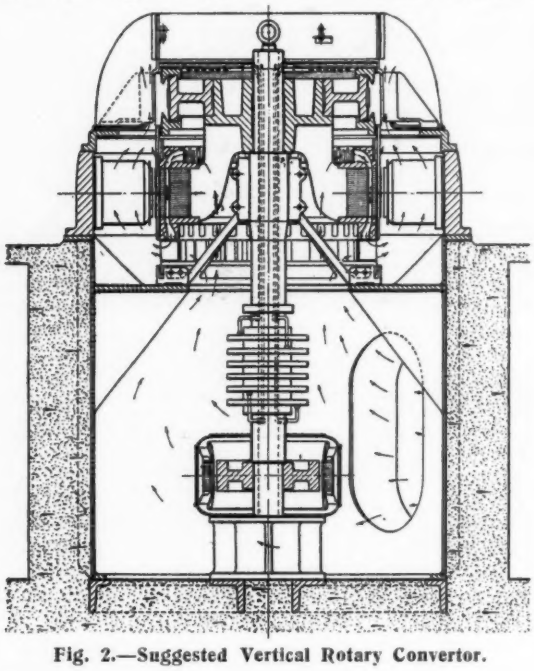
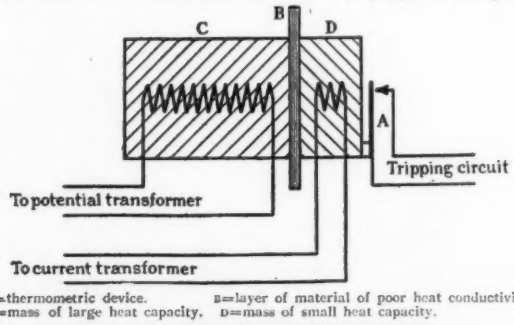


Fig. 2.—Suggested Vertical Rotary Convertor.

present designs in so far as withstanding the effects of short-circuits is concerned. It is proposed to take the tapping points from the front end of the commutator, thence through the hollow shaft to the slip-rings, resulting in a small reduction of the maximum temperature reached by the conductors adjacent to the tapping points, as compared with the more usual construction where the tappings are taken from the back end of the armature, since in the proposed design a



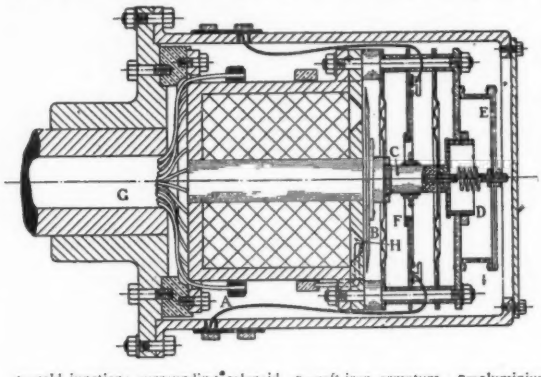
A=thermometric device. B=layer of material of poor heat conductivity.
C=mass of large heat capacity. D=mass of small heat capacity.

Fig. 3.—Double-element Thermal Relay.

small portion of the current will flow directly from the slip-rings to the brushes without passing through any part of the windings at the moment when the current is at a maximum in that portion of the armature. The design shown includes a pony motor, but not an exciter; if the latter is required, it could be of the short, large-diameter type and supported above the pony motor.

Thermal Relays.—The armature is the portion which particularly requires protection, but it has not hitherto been considered practicable to operate a thermal device directly from the armature. Those which have been used are single-element, *i.e.*, they have been heated only by the load current, but there appears to be no reason why double-element relays should not be designed (fig. 3), one section of which would be heated from a potential transformer to represent the armature iron loss and the other (which would be of smaller mass) from a current transformer to represent the I^2R and incremental iron losses. This arrangement would have two advantages:—(1) It would imitate the general heating of the armature under varying ambient and running conditions more nearly than any single-element arrangement could do. (2) If the two elements are separated by a poorly conducting medium and the thermometric device is carried by the current-heated element, the arrangement will also tend to imitate the local conditions which obtain in the armature when heavy overloads occur and large temperature gradients exist across the slot insulation.

If, when armature and relay are hot, the machine is shut down and allowed to stand for, say, half an hour and then started again and put on load, the relay will restart nearly cold, whilst the armature will still be at a relatively high temperature. Only by the use of a double-element relay with potential and current transformers, and by the addition of some device for reducing the rate of heat dissipation of the relay when the machine is standing, can a faithful reproduction of the mean armature temperature be obtained. Such an arrangement would not only be expensive and complicated, but would require costly calibration. The use of a separate relay is fundamentally wrong and the automatic trip should be operated direct from the armature. An arrangement which appears to meet the requirements is thermo-junctions in the armature operating a relay on an extension of the armature shaft contained in a case which also accommodates the cold junctions, the mechanism being so compensated as to operate at a definite absolute temperature, instead of at a definite difference of temperature between the hot and cold junctions, by using a bimetallic strip to vary the tension of the control spring, on the principle of Darling's compensator.



A=cold junctions surrounding solenoid. B=soft-iron armature. C=aluminium armature support. D=adjustable back stop. E=bimetallic strip. F=insulating ring forming fulcrum for 110-volt contact springs. G=end of rotary-convertor shaft. H=3 or 4 resetting pieces interspaced with lugs, engaging with ring actuated by centrifugal device (not shown).

Fig. 4.—Rotary Thermal Relay.

The advantage of this arrangement (fig. 4) is that it allows a large number of thermo-couples to be connected in series, so that a relatively large force can be obtained. The relay should operate on hot-spot temperature and the thermo-couples should therefore be placed between the top and bottom conductors in each of the slots which contain tapping conductors; there might thus be 30 of these thermo-couples connected in series, their current being confined to the rotating parts, the relay closing a contact in an independent circuit at, say, 110 volts.

Discussion in London.

Mr. ROGER T. SMITH opened the debate, remarking that in the case of an average traction sub-station containing two 2,000-kW rotary convertors, wages would amount to about £1,200 a year, but a saving of £1,000 per annum would result if the plant were automatic, which fact entirely altered the economics of low-voltage railway electrification. If a battery were used for control-circuit operation, its charging would involve considerable difficulty.

Dr. C. C. GARRARD thought it right to supersede the human element by automatic plant; in addition to Mr. Smith's economy claim, an automatic station was more efficient and had other advantages that would pay for the extra cost. The high-speed breaker had made such stations possible, but it should more correctly be called a quick-acting breaker. He did not agree with the conducting-vapour theory, the cause of flash-over being probably high-frequency oscillations set up by the arc. Thermo-couples were not desirable devices to add to rotary convertors, for the fine wire conductors might break and would be difficult to repair; continuous hot-spot measurement was unnecessary. Supervisory control exercised by the load dispatcher was better than reliance on thermo relays. If records of operating troubles were compiled in this country as in the U.S.A., they would be extremely useful.

Mr. F. W. CRAWTER did not agree that batteries should be excluded from sub-stations, as they were the only source of energy which would meet the requirements. The author had described a method of charging which had been entirely successful, so that his difficulty was not clear.

Mr. R. ORSETTICH thought it should be possible to avoid over-taxing machines to the extent referred to in the paper, by adopting buffer resistance as used extensively in America; with

two circuit breakers in series, when the first opened it inserted buffer resistance, which lowered the voltage and allowed the circuit breaker to switch itself in again. As regarded motor *versus* tap-starting, that again was a question of over-taxing the machine, which should be avoided. The influence on one relay through another due to stray fluxes could be eliminated by the use of shielding boxes. A vertical machine had been made, but with its commutator downwards, and trouble had been caused by falling broken carbon dust.

Mr. A. E. ANGOLD said thermostats should be placed in more accessible locations; he would not like to have the task of adjusting the special pattern illustrated in the paper. Regarding flash-over, in most cases it was not the original arc which did the damage, but new ones which followed it.

Mr. J. W. TOWNLEY was not by any means satisfied that the use of a high-speed circuit breaker would render an unsuitable rotary convertor satisfactory for traction work. He agreed that machines should not be overtaxed, and also that sub-station ventilation should be positive, but machine designers' indefiniteness had defeated efforts made in that direction. In the case of the vertical machine shown in fig. 2 a flash over on the slip rings below would have serious consequences. Suitable relays could be obtained for use on parallel and "stub-end" feeders, but if either type of feeder were converted to the other, the relays became quite unsuitable. He pleaded for more substantial control-circuit wiring at the back of switchboards, some sort of "solid" system.

Mr. W. WILSON stated that two small vertical machines had been built some years ago with front connections taken through a hollow shaft as shown in fig. 2, and they had both worked well.

Mr. H. B. POYNDER, in reply, did not agree that thermo-couples were delicate devices. He had suggested that batteries should be kept out of sub-stations because all operators seemed to be afraid of the floating system of charging. He could not see why a machine would suffer less shock when buffer resistance was used; one high-speed breaker sufficed. Were not all slip-ring flash-overs caused by conducting gases accumulating round them?

66-kV Outdoor Switchgear.

An important 750,000-kVA Reyrolle installation on the North-East Coast.

SWITCHGEAR has not hitherto been required to operate at 132,000 volts in Great Britain, because the highest transmission pressure employed so far is only 66,000 volts, but experience has been gained of switchgear actually in use at 66,000 volts, and consequently the influence of such important factors as climate has come to be well understood.

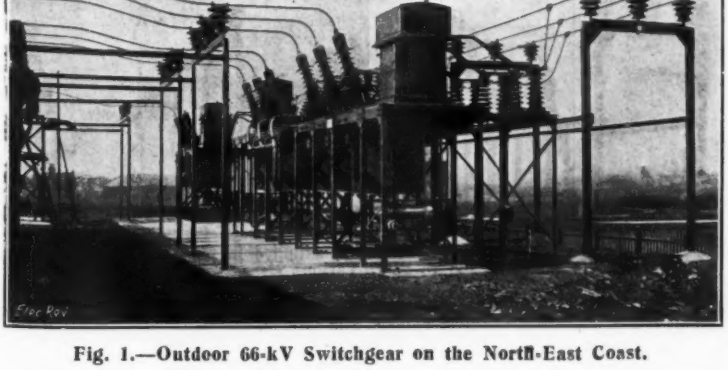


Fig. 1.—Outdoor 66-kV Switchgear on the North-East Coast.

It has to be borne in mind that the present-day tendency is in the direction of making high-voltage equipment, both switchgear and transformers, suitable for erection and use entirely in the open air, instead of attempting to house it under cover; and with the advent of larger switchgear and increasing voltages, outdoor sub-stations, no longer novel abroad, will become more and more familiar at home.

The present position of 66,000-volt equipment installed in Great Britain is that, while several transmission systems are in use at that pressure, only one of them has switchgear on the high-voltage side: a 66,000-volt overhead line runs between the North Tees and Dunston power stations of the Newcastle-upon-Tyne Electric Supply Company, Limited, and its associated undertakings, and a tee-off is taken from it at Stoney Cut, which lies approximately half-way between the two power stations; two 66,000-volt three-phase circuit-breakers are inserted in the main interlinking line, one on each side of the tee-off, and a third, similar to the other two, is connected in the tee-off itself to control the high-voltage side of a 66,000/20,000-volt transformer used to feed into the main distribution network on its secondary side. Messrs. A. Reyrolle & Company, Limited, supplied the switchgear for both sides of the transformer, and thus have the distinction, so far as the high-voltage side is concerned, of having built the control gear for a sub-station of a kind at present unique in this country.

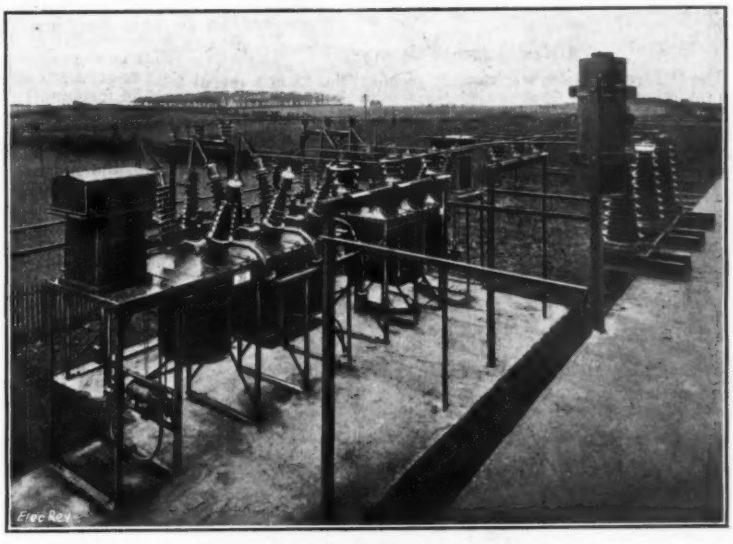


Fig. 2.—Reyrolle Gear at Newcastle.

The photographs reproduced as figs. 1 and 2 clearly indicate the arrangement of the gear. The three circuit-breakers have been erected side by side in the open air, and are all visible in fig. 1, which also shows one end of the overhead bus-bars at the right-hand side of the switchgear in the illustration, and, on the left-hand side, one corner of the sub-station in which the control gear for the secondary side of the transformer is housed. The cables from the overhead line terminate in oil-filled sealing bells mounted on the roof of the sub-station, one set of them being prominent in fig. 2; from the tops of the sealing bells, overhead conductors cross to the circuit-breakers, and isolating switches are mounted between the other terminals of the breakers and the connections to the bus-bars; the isolating switches are shown closed in figs. 1 and 2, they being operated by sideways movement of the vertical insulators that carry the horizontal isolating contact-bars, the links between the contact-bar and the breakers being hinged, as the illustrations show. Fig. 1 includes all the switchgear. Fig. 2 is a closer view of only two of the circuit-breakers, one being for the North Tees side of the main line, and the other for the transformer tee-off; the latter is the further away of the two in the photograph, and there should be no difficulty in tracing the connections from the bus-bars through the isolators to the circuit-breaker, and from the other side of the circuit-breaker to the overhead conductors, which are carried across, above the roof of the sub-station, to the high-voltage side of the transformer, which (not shown in any of the photographs) is erected in the open air on the other side of the sub-station.

The photographs were taken just at the end of the erection of the equipment in 1926 (it will be noticed, indeed, that one or two of the connectors had still to be fitted), and the equipment itself has been in successful operation since that time. The circuit-breakers are of the oil-immersed type, the remaining parts, including the bus-bars, being air-insulated. The breaking capacity is 750,000 kVA, and the current rating 300 amperes at 66,000 volts.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A New Vacuum Cleaner.

The "Tornado" electric vacuum cleaner, fig. 1, is a recent introduction of the ELECTRICAL EQUIPMENT AND CARBON CO., LTD., Bank Buildings, 109-111, New Oxford Street, W.C.1. It is a neat and compact machine, fitted with a universal motor, and can be readily converted to a blower. The wheels render the machine particularly mobile and the handle

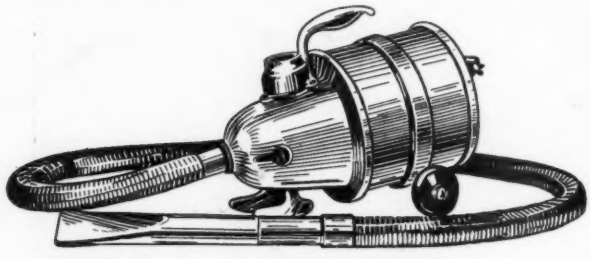


Fig. 1.—The "Tornado" Vacuum Cleaner.

enables it to be easily carried when necessary. The aluminium hose is screwed into the body of the machine at either end, according to whether the cleaner is required for suction or blowing, and the suction-tube sections are of the slip-on pattern. The switch is in a protective recess in the rear of the handle.

The "Work Meter."

A device which registers the motion of machinery in its relation to time, and so discloses preventable "idle time," is the "Work Meter," an instrument which has recently been introduced by Messrs. LEWENZ & WILKINSON, LTD., 25, Victoria Street, S.W.1. The meter consists of two essential parts, the impulse sender, which is suitably linked to and driven by some revolving or reciprocating member of the machine under observation, and the recorder, fig. 2, which produces on a paper chart the details of the machine's performance. In

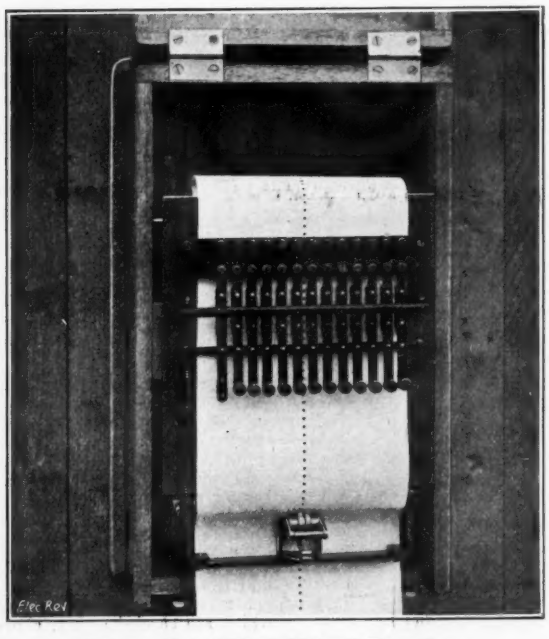


Fig. 2.—The "Work Meter" Recorder.

addition to these two members, a connection is made to a clock, by means of which, and a simple contact to its escapement, periodic electric impulses are transmitted to the meter. These impulses advance the chart at a predetermined rate and the time is continuously recorded at the side of the chart. Each instrument is designed to record the motion of twelve machines or machine parts, and thus requires twelve impulse senders. The charts are arranged to run continuously for 31 days. The impulse sender contains an adjustable gear which can be set to suit the speed of any machine to which it is attached, thus enabling electrical contact to be made at pre-arranged fixed periods, irrespective of the normal speed of the machine by which it is driven. It is connected in series with the corresponding electromagnet on the recorder and a battery or other source of power, so that every time the contact maker operates the magnet is energised. The armature of the magnet carries a needle which perforates the chart when the armature is attracted. Simultaneously another electromagnet, receiving regular impulses from the master clock, records the time at the side of the chart.

The paper is drawn under the row of needles by a mechanism which is likewise controlled by the master clock. All twelve machine needles are set in a straight line and equally spaced across the paper in line with the time markings.

A Barrel-Searching Lamp.

The accompanying illustration, fig. 3, is of the 4-volt "CEAG" can and barrel searching lamp, which is marketed by Messrs. CEAG, LTD., 53, Victoria Street, S.W.1. It is intended for the rapid inspection of petrol cans and barrels,

Fig. 3.—Inspection-Lamp Outfit.

and is claimed to be suitable for use in the most explosive atmospheres, carrying a patent safety fuse. The battery, which consists of two cylindrical cells, is carried in a mining-type aluminium case and connected to the long-handled searching torch by a special flexible c.t.s. cable.

A New Electric Heater.

A recent introduction of Messrs. BRITISH B.A.G., LTD., 23, Farringdon Avenue, London, E.C.4, is the "Maxim" electric heater, fig. 4. It is designed particularly for use in such places as garages and workshops. It is of the convector, non-

Fig. 4.—The "Maxim" Radiators.

luminous type, and is supplied in models to suit all voltages from 100 to 250. Various sizes, with loadings from 700 to 3,000 W, can be supplied, and, with the exception of the smallest size, each radiator has a three-heat regulator switch. The finish is black and bronze.

New Electric Fires.

With reference to the description of the "Corporation" electric fire of the COVENTRY ELECTRICAL APPLIANCES, LTD., which appeared under the above heading in our last issue, we are asked to state that the standard loading is 600 W and not 500 as given.

Electricity in the Factory.

Extensive B.T.-H. Electrically-driven Equipment installed by Messrs. Wrigley Products, Ltd.

VERY specialised machinery is used in the manufacture of chewing gum by Messrs. Wrigley Products, Ltd., at their recently-erected factory adjacent to the L.M. and S. Railway at North Wembley, London.

Absolute cleanliness obtains throughout the five-storey factory, which occupies some 50,000 sq. ft. and has a superficial floor area of 190,000 sq. ft. The whole of the building is well lighted by large windows in the day time and by "Mazda" lamps at night, while the lay-out of the conveying plant and machinery is such that, not only manufacturing operations, but also packing and dispatch, are carried out efficiently. The accompanying illustrations show two of the electric motor drives, electric power from the 415-volt, three-phase, 50-cycle mains of the North Metropolitan Electric Power Supply Company being used throughout the factory. All the motors, together with their starting equipment, push-button control stations, &c., were manufactured by the British Thomson-Houston Co., Ltd., the total power of the motors being 1,250 h.p., and they vary in size from 175 h.p. down to fractional horse-power rating. As a general rule the various machines are individually-driven, and thus full advantage is taken of the ease with which the factory can be operated in the most economical manner at all times; also, the necessity for long lengths of shafting is eliminated, and the motors can be mounted in any position which may be most convenient in any particular case.

Briefly stated, the process of manufacturing "Spearmint" chewing gum is as follows:—The raw gum is first subjected to separate crushings and then weighed on to trays, which are transported to the conditioning room until ready for the next operations, which consist in heating in rotating steam kettles and refining in a special machine under enormous pressure. These operations are carried out on the top floor of the building, and the refined gum descends by gravity to the next lower floor, where it is kneaded, the flavouring added, and then rolled into sheets and cut into the little strips which are so universally known to the public.

For the manufacture of sugar-coated "P.K." chewing sweets, the process is similar during the earlier stages, but subsequent to the sheeting operation small pieces are cut and transported to revolving pans, where pure sugar is added; the pieces are next passed through a machine which imparts a glazed effect. Both the "Spearmint" and "P.K." pieces are wrapped and packed by automatic machines of precision, and the packets conveyed to the store, whence they are dispatched as required to all destinations.

It will be appreciated that considerable power is required to drive the manufacturing machinery, as the daily output of the factory is over 5 million pieces, and is expected shortly to reach 10 million pieces. It is most important, however, that the various operations be carried out at specific temperatures and degrees of humidity, to obtain which elaborate air-conditioning equipments are installed. That for the coating department is shown in fig. 1, and was supplied by the Carrier Engineering Co., Ltd. The motor on the left is of 175 h.p., and the two in the foreground are of 17.5 h.p. each; on the right are the starting equipments. The motors employed are of the slip-ring and squirrel-cage types. One of the smaller motors (5 h.p.) drives part of the raw gum crushing plant, and the sugar mills require 15-h.p. driving motors.

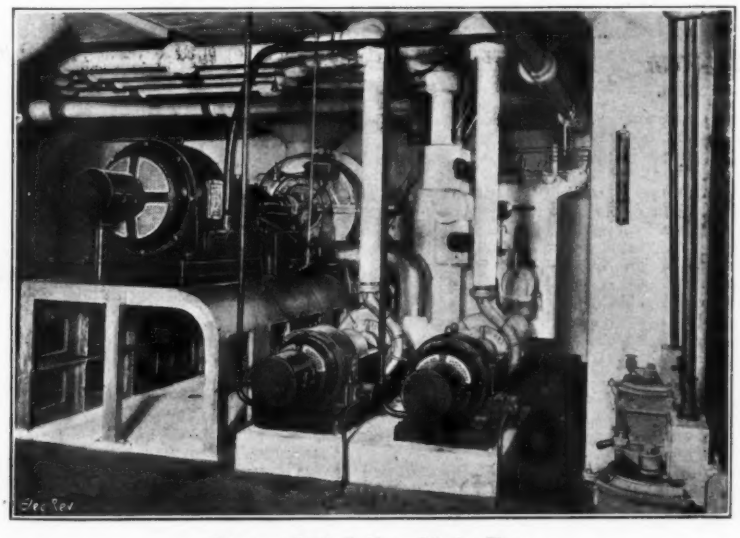


Fig. 1.—"Carrier" Air-conditioning Plant.

A Drama of the Home Electrical.

THE following excerpt from a recent—very recent—Moldo-Slavonian drama (in nine acts and a couple of by-laws) has a certain topical interest which may appeal to electrical contractors.

UNDER TWO FLAGS.

The HOUSEHOLDER.
ECA, NREIC, *two Sorcerers.*
DJERI, *a Charlatan.*
Mr. GOOP, *the City Electrical Engineer.*
CHORUS *of* WIREMEN.

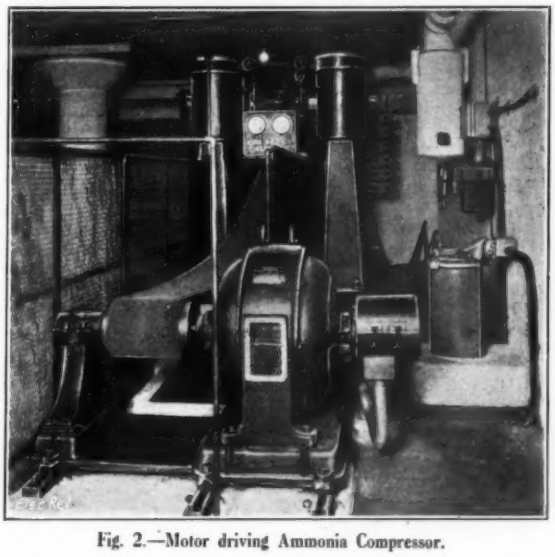


Fig. 2.—Motor driving Ammonia Compressor.

Act 8, Scene 37.—*Evening at Czzzhoddyi. A lonely hut in the High Street. The* HOUSEHOLDER *is discovered at the door of it, thinking noisily, in rather blank verse.*

The H.:—

Lo, Night now spreads her sable mantle wide,
And all within is dark. I need a light:
Whether a candle, or Electra's torch,
Or even gas——

Enter ECA *and* NREIC, *running. Mr.* GOOP *follows more sedately, an Application Form in his hand.*

ECA: Electric light, I think you said. Allow me, worthy sir, to quote you. Cross but my hand with gold, and all my magic's at your service. Behold! (*He unfurls a banner charged with a mystic device: a ring loosely wound with wire, and bearing a label cabalistically inscribed.*) Behold the symbol of a Perfect Job!

Mr. G. (*proffering a fountain pen to the* HOUSEHOLDER): That's so. If you would kindly sign this form. . . .

Meanwhile the CHORUS *of* WIREMEN, *garlanded with C.M.A. cable, have entered unobtrusively, weaving a fantastic dance to solemn music, the while they sing:*

C. *of* W.:—

To work for E-C-A
Is our idea of heaven.
We'd love to, all the day,
But—as it's gone eleven. . . .*

Exeunt hurriedly.

The H.:—

I like your pretty banner very much,
So I'll entrust——

NREIC, *rushing forward:* Nay, stay, dear sir! Let me at least submit a competitive price. Cross my hand with gold, or even Treasury notes, and all my mystic art is yours to command. And this—(*he unfurls a banner bearing an illegible, but quite impressive, monogram of magic runes*)—this is your guarantee of a Perfect Job!

Mr. G. (*prodding the* HOUSEHOLDER *in the stomach with his pen*): That's so. Please sign this form—here.

Enter CHORUS *of* WIREMEN, *festooned with Nonazo, dancing to very slow music, but* accelerando *as they cross over. They sing:*

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* Moldo-Slavonian time-keeping is notoriously erratic.—*Translator's Note.*

C. *of* W.:—

Back N-R-E-I-C:
You're sure to back a winner.
We'd love to work for he,
But now it's time for dinner.

Exeunt hurriedly.

The H.:—

These merry sprites, methinks, give good advice,
And so to you I'll——

ECA, *grabbing him by the arm:* Take heed! Mine is the one true sorcery! Only under this seal (*displaying his banner*) can you be sure——

NREIC, *grabbing his other arm:* No, no! Mine is the genuine magic! And this device (*thumping him over the head with it*) the only——

The HOUSEHOLDER *collapses, bewildered.* ECA *and* NREIC *fall to fighting across him, with a vast flourishing of their standards, which are presently hopelessly entangled.*

Enter DJERI, *stealthily. He stoops over the prostrate* HOUSEHOLDER *and speaks in his ear.*

DJERI: Cut 'em both out, guv'nor! *I* ain't got no standard, nor yet I don't ask for no gold; but cross me 'and with silver, and I'll give you as good a job as either of 'em. Any'ow, *you* won't see no difference!

Mr. G. (*thrusting his pen into the* HOUSEHOLDER'S *hand*): That's so. Sign this form—at once!

Enter CHORUS *of* WIREMEN, *hung with bell wire. They tread a stately measure round the hut, strewing it with ceiling roses, junk, and other flowers, as they chant:*

C. *of* W.:

While such as DJERI thrive
We'll work for him also.
But as it's half-past five,
Let's knock off sharp and go!

They vanish.

Mr. GOOP *relieves the dazed* HOUSEHOLDER *first of the signed Application Form and then of his purse. He carefully counts out and pockets his deposit.* DJERI *seizes what is left. Exeunt severally.*

The HOUSEHOLDER *struggles to his feet and looks across to where, a heaving mass of boots and bowler hats and emblazoned drapery,* ECA *and* NREIC *are still fighting doggedly beneath their shattered banners.*

The H.:—

Two worthy sorcerers! Yet how could I
Decide whose magic were the better? Now,
Between them all, I fear I am undone.

(*He feels his bumps and empty pockets.*)

Well, well, since Mr. GOOP says he's all right,
I'll e'en trust DJERI, and switch on the light!

(*He does. The hut bursts into flames.*)

CURTAIN.

H.R.T.

Meter Engineers' Technical Association.

At the tenth general meeting of the above Association on January 27th, Mr. P. G. Lloyd, A.M.I.E.E., read an interesting paper on "Refinements in Power Plant Testing." With the aid of lantern slides, the author described in detail the apparatus and instruments developed and used in connection with the carrying out of efficiency tests on large turbo-alternator units, and dealt fully with the latest methods employed to secure the highest possible accuracy of measurement combined with the minimum expenditure of time and trouble. The measurement of water, steam, vacuum, speed variation, and of the electrical quantities involved in the alternator output, was thoroughly analysed, and curves and data were presented to show the value of conducting tests as accurately, and at as frequent intervals, as could economically be arranged.

Mr. R. M. Longman, in opening the discussion, voiced the opinion that every capital station should have included in its lay-out adequate provision for the quick and accurate testing of the plant installed.

Mr. J. E. Foster, in referring to the precision kWh meter mentioned in the paper, said that it had been proved that the electrical measurements were always the source of the greatest inaccuracies, and any improvements in this connection would have a great bearing upon test results.

Mr. E. W. Hill queried the means employed to obtain the different loads and power factors at which the tests were carried out, and the allowances to be made for the various auxiliaries.

Mr. G. D. Malcolm was certain that the paper would prove to be of great value to those members whose duties included the arranging for, or carrying out of, acceptance or periodical tests on power station plant. It would also, he thought, confirm the logical view that the maintenance of all station instruments—water, steam, and electric—should automatically come under the jurisdiction of the meter department, instead of being left to the running staff, whose normal duties were running, not testing, the plant.

A New Wiring System.

Some descriptive notes of the equipment recently introduced by The Liverpool Electric Cable Co., Ltd.

THE "Liverpool Lecite" system employs either metal or non-metal sheathed cables, in each case the conductors being insulated with "Lecite," a non-hygroscopic, tough, and resilient rubber insulating material. The separate conductors are rendered readily distinguishable by coloured

Fig. 1.—Junction Box for Non-metal Sheathed Cables.

strips of non-hygroscopic material, which run throughout the whole length of the cable in the form of a narrow ribbon.

For the non-metal sheathed cables the special feature of the system, apart from the cable, for which "Lecite" forms the sheathing, is the universal type 4-way junction box shown in fig. 1. It is made of a non-hygroscopic, non-brittle and flame-proof material and consists of a cover and base, the latter being fixed directly to its support by two screws. The box has four entrances, any one of which can be closed at will by changing the position of a removable and reversible rubber-compound bush. This will take up to 3/.036 flat 3-core or 7/.064 twin cables; it is supplied blank and the entrances can be cut out with a penknife. A 3-way tee box constructed on similar lines is also available.

The system is primarily one for surface wiring, but hollow partition walls can be taken advantage of in order to conceal the cable, and in a similar manner the cable can be run on joists under floor boards; the fixing is achieved by using heavily plated clips and saddles. The neatest surface job is obtained by the use of wood capping. This is made with a pleasing contour; it mitres easily, and takes a paint or varnish finish very effectively. Bonds and corner pieces are provided for those cases where awkward corners are to be negotiated.

Fig. 2.—Metal-sheathed Cable Joint Box.

The metal-sheathed cables are insulated with "Lecite" and a lead-alloy serves for the sheathing. With these cables the joint box shown in fig. 2 is utilised. It ensures, it is claimed, that perfect electrical continuity of the sheathing is maintained. A particular feature of the box is the patent bonding ring which is riveted to the base of the box and carries lugs normally bent at right angles to the base. These lugs serve as shutters for closing the cable entrances when they are not required. In order to admit a cable into the box, the shutter is pressed down by the thumb, so forming a supporting platform for the cable and preventing it from coming into contact with the sharp edge of the box.

Standard wiring fittings are applicable to the system throughout, and switches, ceiling roses, wall plugs, and so on, of any reputable make can be employed.

Telephone Progress in 1927.

Statistical Extracts from Annual Reports to District Advisory Committees.

PREPARED primarily for submission to the Telephone and Telegraph Advisory Committees in the various districts, the annual statements of the progress made in the British telephone service during 1927 contain statistics of interest, as will be evident from the following brief extracts.

The wireless telephone service instituted between London and New York was extended to the provinces in Great Britain, the whole of the U.S.A., and certain Canadian cities. A service was made available from any part of Great Britain to Sweden (all parts), Switzerland (all parts), Danzig, Denmark (Copenhagen), Norway (Oslo); from London to Austria (Vienna), and from any part of Great Britain to Czecho-Slovakia (Prague) and Hungary (Budapest). The older established services to Belgium (all parts), France (principal towns), Holland (all parts) and Germany (all parts) were improved. The number of Continental and transatlantic calls increased by 23,715 to 299,743.

London Area.

In the London district (Mr. W. A. Valentine, controller; Mr. R. McIlroy, superintending engineer) the outstanding event of the year was, of course, the opening of the first public automatic exchange in inner London to accommodate ultimately 9,400 lines; in connection therewith a mechanical tandem junction exchange was established, and the necessary automatic equipment was installed in 60 manual exchanges within 10 miles of Oxford Circus. A new toll exchange was installed at the G.P.O. South for outgoing traffic, the old one being retained for switching incoming traffic.

The number of exchanges increased by 6 to 118 and exchange lines by 9.5 per cent. to 327,043, while the proportion of residence lines is increasing considerably; private wires, which connect subscribers' offices without passing through a public exchange, totalled 15,123.

The total number of exchange and private telephones was 565,590, the rate of increase being thus about 8.8 per cent.

The total number of manually-operated private branch exchanges was 24,250, an increase of 1,280, and there were also 121 private branch exchanges of the automatic type, as compared with 97 at the end of 1926. Removals from one address to another and alterations to apparatus at the request of subscribers were effected in approximately 34,330 cases.

The number of call offices was 5,076, the increase being 390; the number of kiosks open was 755, and 500 multi-coin boxes had been installed.

The net increased capacity provided immediately by eight new exchanges (three replacing existing equipment) amounted to 3,130 lines, and in addition 43 existing exchanges were extended, and work was in hand on 13 new and the extension of 17 existing manual exchanges.

The increase in junction traffic necessitated the provision of 32 new cables containing over 60,000 miles of wire. The total mileage of single wire provided for subscribers' lines and local junctions was 2,389,138, an increase of 359,138 miles. There was 9,433 miles of ducts, or pipes, an increase of 2,031 miles. The total length of pole line in London was 5,708 miles. The number of local calls originated was 553,534,371, and the average number of inland trunk calls originated daily was 16,340, representing an increase of 11 per cent.; the increase in night traffic of all classes was 19 per cent. The average number of calls outgoing daily from London at the toll exchange was 17,000, an increase of 100 per cent. during the past five years. The number of phonograms dealt with was estimated to be about 1,730,000, an increase of 7 per cent.

The operating staff employed in the exchanges was about 10,200, and over 1,800 new entrants passed through the operating school during the year; in addition, 74 telephonists employed by subscribers for the operation of their private branch exchanges were trained, and 280 telephonists received specialised instruction to fit them for the new method of operating at the tandem and automatic exchanges. About 7,800 engineering workmen were employed.

Quality of service was well maintained, the average time of answer to subscribers' calling signals being 5.5 seconds, and the average time from the commencement of a call until the called subscriber answered was 37.8 seconds.

Manchester District.

In the Manchester area of the South Lancashire District (Mr. W. J. Medlyn, M.I.E.E., superintending engineer) new telephone instruments connected numbered 9,162, a net increase of 4,852. The number of effective trunk calls and telegrams increased by 400,000 to 6,218,106; local calls increased by four millions to 61 millions. The average time taken to answer calls was 5.9 seconds. The new exchange buildings for the Ardwick, Collyhurst and Moss Side areas, which will be the first in the Manchester area to be converted to automatic working, are expected to be ready for the installation of the equipment by March, 1928, and 120 miles of single duct have already been laid. A new exchange was opened at Stalybridge, and extensions were provided at 21 exchanges.

The new repeater room at the Manchester Head Post Office and the installation of equipment is proceeding; of the ultimate 300 repeaters, 90 are to be installed at the outset. Twelve new private automatic branch exchanges were installed, and an interesting alternative to the usual private branch exchange was embodied in an order from an important industrial concern for a long-distance private wire system with the controlling switch in the Manchester trunk exchange, the operating to be performed by the Post Office staff.

Street kiosks numbered 247, an increase of 53. The Watch Committees of Manchester, Salford, and Stockport propose to erect police call boxes at suitable sites on the constables' beats for reporting to headquarters at regular intervals and in cases of emergency; the service will also be available to the general public for reporting fires, calling for an ambulance, or for police assistance, and somewhat similar facilities are being provided at Denton and Ashton-under-Lyne.

Birmingham Area.

In this total area of 700 square miles (Mr. R. A. Weaver, superintending engineer) there were 76 exchanges; extension of equipment at 30 existing exchanges was made, and the number of instruments increased by 8.66 per cent. to 62,937. Private branch exchanges numbered 3,155, of which number 39 were automatic; nine such installations were completed, having capacities ranging from 24 to 60 lines, and an extension of 80 additional lines was also made to an existing automatic p.b.e. The number of telephones connected with private branch exchanges totalled 23,124. The demand for telephones at private residences continues; 1,541 stations were added, making a total of 11,351; 112 additional call offices increased the total to 754, of which 378 were street kiosks.

In the local exchanges 52,297,197 calls, including short-distance trunk calls, originated in the district during the year, an increase of 1,696,347, while long-distance calls controlled in the trunk exchange increased from 3,362,978 to 3,663,446. The number of telephoned telegrams dealt with was 787,133, an increase of 42,305. During the year four new buildings for the accommodation of automatic exchanges were completed, and it is anticipated that the final lay-out of the whole of the necessary exchanges within seven miles radius of the centre of Birmingham will be completed during 1928.

Liverpool and District.

New manual exchanges were provided at Huyton and Maghull, and many other exchanges were improved and increased. During the year 7,390 new telephones were fitted, a net increase of 4,004, or approximately 6¼ per cent. The number of calls dealt with in the district was 64¾ millions, an increase of 4 per cent., and the total written complaints represented 1 to approximately 37,000 calls dealt with.

West Yorkshire Area.

In this district (Mr. T. B. Johnson, M.I.E.E., superintending engineer) 5,055 lines and 7,972 stations were added, net gains of 5.5 per cent. in both cases. Trunk calls numbered 5,615,929, and local and junction calls 38,456,222; phonograms increased by 10.6 per cent. to 430,325. Kiosks numbered 171, the total public call offices being 938. Numerous exchanges were transferred to more commodious premises, two of them being automatic and one having a satellite.

York District.

During the year 4,142 new telephones were fitted, a net increase of 2,050, or 8.5 per cent.; the total number of telephones in use in the district was 26,067, a growth of 10,516. A new automatic exchange replaced the old manual exchange at Harrogate, and concurrently a largely improved trunk service was introduced. To the three automatic exchanges in the district (Grimsby, Harrogate, and York) 8,776 automatic telephones were connected, or one-third of those in the area. New exchanges were opened at four places, and at two others the existing equipment was replaced by new c.b.s. equipment in more commodious premises. Extensions of the equipment were made at 34 exchanges. The number of effective trunk calls was 2,533,500, the rise representing 6.3 per cent. There were 310,000 phonograms, approximately 6 per cent. increase; 11,670,000 local calls were effected, an increase of nearly 9 per cent. Some 68 additional junction and trunk circuits were added to the system, and call offices increased from 514 to 589; of that number 77 were street kiosks.

Algerian Bauxite Deposit.

A deposit of bauxite (aluminium and iron ore) has been discovered in the Atlas mountains; the outcrop alone is estimated at about 20,000,000 tons. The deposit is very rich and contains about 70 per cent. of pure aluminium, says the *Financial News*, which points out that a series of water falls near the spot where the deposit has been found will provide motive power and enhance the value of the discovery.

Electricity Supply in Glasgow.

An Administrative Inquiry.

A REPORT regarding the administration and working of the Glasgow Corporation Electricity Department was issued recently by a Special Sub-Committee to members of the Electricity Committee. The Special Sub-Committee, it may be recalled, was appointed in August last.

Dealing with the generating stations, the report states that the capital expenditure to date on Dalmarnock station has been fully two and a half millions sterling, and on Port Dundas nearly £600,000—a total of £3,135,000. By means of depreciation and sinking funds, the total outstanding debt on the generating stations has been reduced to about two millions. It is stated in connection with the last two turbo-alternators installed at Dalmarnock, at a cost of £468,000, that the subsequent demand could have been met by the plant existing at the time, with the result that the department could have saved by the end of the current financial year a sum of £143,401 in respect of debt charges, and still have had a considerable margin for future increase in the demand.

Regarding the showrooms, the capital expenditure has been over £48,000, and the report alleges that there has been a loss through the buildings not being fully utilised.

The total capital expenditure in connection with the Welfare section has been £16,787. The comment here is:—The use of tennis courts has not been restricted to employés; the membership has included twice as many of their relatives as of employés. The total amount that had been spent on welfare to date was £22,262, and the report asserts that over £20,000 of this was unauthorised and quite unjustifiable.

The report continues: There are 22 electric vehicles, 5 petrol vehicles and motor cycles, which have cost £24,966. Several vehicles were purchased second-hand and repaired by the department; in the case of one vehicle which cost £50, it is asserted that £389 was spent on repairs. Under a heading of lands and buildings in use for the purposes of the undertaking, the report states that at Dalmarnock some 31 acres of ground has been acquired, at a cost of £37,000, of which only a small part has been utilised for the purpose of a tipping place for ashes.

By a minute dated February 13th, 1925, on a report by the manager "that it would be desirable to alter the system of supply in certain small portions of the outlying area from direct current to alternating current, thus obviating the necessity of increasing the number of rotary convertor sub-stations," authority was given to give effect to this proposal. No estimate of the cost, the report states, appears to have been submitted, and no consideration was given to the bearing of this proposal on the finances of the department, but already a sum of £124,645 has been spent on the alterations, a sum which has been increased to £150,899 in making provision for the growth in demand, and it was the intention of the department to spend £507,640 within the next three years.

It has been the practice of the department, the report continues, to purchase materials and stores, &c., liberally in advance of requirements. The document shows that the department was carrying upwards of one year's stock, involving charges for interest on the purchase price for a considerable time before any use was made of the goods. The result of this policy of buying in advance of the requirements has been that owing to over-estimation of the requirements, change in type, or other causes, no use is likely to be made for a long time to come, of certain cables. Some cables have been in stock for fully six years. These cables cost a considerable sum, and still appear in the books at cost price, although some of them may never be used, and may fall to scrap value. The depreciation on these cables was estimated by the stores superintendent at £15,000, and stock worth £29,000 having been in hand for a period of 4½ years, the interest charge amounts to £6,000. This system of liberal purchase has not been confined to cables, but applied to other purchases also. The total stock in hand at the end of last May was worth fully £137,000

Dealing with the numbers and duties of the staff, the Committee refers to the cost of Port Dundas station, where, it is stated, there is a staff of 50 men retained throughout the whole year, although this station is only running for a few months at most. It is explained that the spare time of the men is taken up on repair work when the station is not working.

The report further states that since 1914 the capital expenditure has increased 321 per cent., the outstanding debt has increased 287 per cent., the number of consumers has increased 233 per cent., the energy sold has increased 249 per cent., and the gross revenue has increased 367 per cent. These percentages, the report adds, show that the capital expenditure is being piled up more rapidly than the business done, notwithstanding the increased demand for electricity, necessitating higher suppiy charges to meet the increasing debt charges, with the result that the cost to consumers generally is now fully 48 per cent. higher, and yet the revenue last year failed to meet the expenditure by the sum of £97,303.

Summing up, the report states that it has undoubtedly been the custom of the department to incur the expenditure of large amounts on various purchases without the express cognisance and approval of the Electricity Committee. The expenditure in connection with the substitution of alternating current for direct current is a case in point.

It is accordingly recommended that before any policy is embarked upon it should receive the express approval of the Committee; that a detailed scheme with a relative programme and time schedule should be submitted to it for approval, showing how the policy is to be carried into effect, together with particulars of the cost and the effect of the same from a financial standpoint; and that the estimate should not be exceeded without full particulars and the reason for the same being reported to the Committee with a view to its sanction being obtained to any excess over the estimate.

The Electricity Committee has met twice since the publication of the report. On Tuesday (January 31st), at the close of a meeting, it was intimated to the Press that the Committee had passed unanimously the report of the Special Sub-Committee. It was also stated that the Committee, on a division, agreed to remit to the Special Sub-Committee to make recommendations as to the reorganisation of the department. The question did not come before the Corporation at its meeting on Thursday (February 2nd), and the recommendation of the Committee will not be discussed until the fortnightly meeting on February 16th.

It is understood that the manager is to make a statement in answer to the criticisms of the Sub-Committee.

Correspondence.

Correspondents should forward their communications* as early as possible.** ***No letter can be published unless we have the writer's name and address in our possession.

The Testing of 33,000-Volt Cables.

May we ask your indulgence to reply to the letters of your various correspondents commenting on our article on the above subject in your issue of November 25th, 1927? We propose to deal with the criticisms under the headings of the various tests, as set out in the original article:—

Dielectric Resistance.—As Messrs. Riley, Tims and Silver state, the insulation resistance varies considerably with the section of the cable, the drying and impregnating process, and the materials used. The limits given, therefore, are already rather wide. There is no objection, however, to raising the upper limit or even suppressing it entirely.

Pressure Test.—Only one correspondent, Mr. Silver, criticises this test as being too severe, and proposes one and a-half times the working pressure for six hours at 50 deg. C. In the first place, this test does not appear to be practicable as a factory test to be made on every drum length of cable. Further, the test of three times the working pressure for three minutes has shown that, with the value of the maximum stresses actually used, no damage results to the insulation. The pressure proposed by Mr. Silver at the working temperature seems rather low, in view of the fact that in operation there may often occur in the network (due to switching surges and the like) over-pressures of the order of twice the working pressure. As regards the test at 50 deg. C., experience has shown that breakdowns occur in service more often at the time of light load and low temperature. From experience, we believe that a pressure test made at 50 deg. C. would not add substantially to the information afforded by the tests which we propose.

Breakdown Test.—There are two critics of this test—Mr. Tims, who would like to observe the voltage-time characteristic, and Mr. Silver, who wishes to omit it altogether.

No doubt the voltage-time characteristic may be a most useful means for studying systematically some qualities of the insulation of cables in general, and of a given manufacture in particular. At present, however, our knowledge of the fundamental laws of the relationship breakdown-time is insufficient, and the significance of this characteristic is not thoroughly understood. We are, therefore, not able to draw definite conclusions from such a curve, and still less to compare quantitatively several of these curves relating to different makes.

Further, it takes a long time to obtain such a curve, so that this test cannot be considered as a routine test at the moment. Other proposals have been made, *e.g.*, to determine only one or two points of the curve, say the breakdown value after two hours. As, however, we do not know the law of the curve, such a two-hours' test will have only an arbitrary value.

Much more could be said about this interesting voltage-time characteristic, but from the above it may be seen that in spite of its scientific interest, the test cannot be considered at present to be suitable for routine work.

We do not agree with Mr. Silver that the breakdown test should be omitted, as it gives a good indication of the consistency of manufacture, particularly when it is made on several samples. It is a fact that this test has proved to be a necessary supplement to the tests based on the measurements of power factor.

Bending Test.—Three correspondents comment on this test—Mr. Tims, who again proposes to observe the voltage-time

characteristic; Mr. Silver, who suggests observing the power-factor voltage characteristic; and Mr. Elwin, who suggests that the test should be made at a maximum temperature of 25 deg. C.

As regards Mr. Tims's suggestion, the same arguments apply as in the case of the breakdown test.

Mr. Silver's proposal to measure the power factor-voltage characteristic after bending is quite interesting. As a matter of fact, such measurements have been made by us. We do not believe, however, that this test is a necessary supplement to the proposed tests, because deterioration of the test piece produced by bending will be detected by the breakdown test which follows.

We believe it is always possible, even in summer, to find some place, however small, in a factory where the bending can be done at a temperature of 20 deg. C.

Stability Test.—Mr. Riley objects to the 10 per cent. margin, as far as cables with low power factor are concerned. He states that a percentage of 10 per cent., as proposed, would be to the disadvantage of a manufacturer making cables with a very low power factor, compared with another manufacturer whose cables give a power factor approaching the maximum allowed. To this criticism we would state that we have checked our proposal by a number of test results on cables with power factors of anything between 0.004 and 0.015. The proposal was put forward because of its simplicity and its practical possibility. On the other hand, it is possible that other proposals to fix this limit may be made, which may be equally or even more feasible from other points of view. A low power factor, especially one that remains low with increase of pressure or temperature, is certainly desirable, and manufacturers of such cables should be encouraged. It may be that for very low power factors of, say, 0.004 and below, the proposed margin of 10 per cent. will prove, in some cases, less favourable to the manufacturer than the same percentage for a cable with a high power factor, taking into account the relative importance of the errors in the measurements of temperature, power factor, &c. If such should prove to be the case, we should not object to the alteration on the lines of Mr. Riley's proposal, giving the cable with the low power factor an advantage rather than a disadvantage. Whilst his proposal to fix a maximum value of 0.015 for all cables probably goes rather far, due consideration may be given to his objection by adding a limit clause to the effect that differences no greater than, say, 0.0005 or 0.0006, shall be admissible

Insulation Test.—Several correspondents find our proposed d.c. pressure of five times the actual a.c. working pressure too high compared with an a.c. test pressure of twice actual working pressure, that is, a d.c./a.c. ratio of 2.5. This ratio has been proposed for two reasons:—

1. In most cases the customer would prefer a.c. testing, which, of course, involves a higher kVA than is generally available for testing. The manufacturer, on the other hand, prefers d.c. testing on account of its greater simplicity. In such cases a discussion will probably arise and the manufacturer has to make some concession by fixing the d.c. pressure as high as possible.
2. The available literature indicates that the d.c./a.c. ratio of 2.5 seems justified by scientific tests. For this reason, and as a result of practical tests made in the past, we feel that this ratio of 2.5 is allowable and not detrimental to the cable insulation.

On the other hand, we see no objection, from the standpoint of security in operation, to adopting the value of 2 for the d.c./a.c. ratio if the user is satisfied with the specification of this figure. Indeed, the recently-published proposed new German rules specify the d.c./a.c. ratio of 2.

As our present knowledge of the mechanism of breakdown under d.c. and a.c. pressure is not very complete, it does not seem possible, without more thorough knowledge of the subject, to be more definite with regard to the value of the d.c./a.c. ratio.

Mr. Tims's proposal to measure the high-pressure d.c. current passing through the cable before and after it is laid is quite interesting We submit, however, that our present knowledge of this phenomenon is not sufficient to enable us to draw quantitative conclusions from the figures obtainable from such tests.

M. Höchstädter.
E. Bowden.

London, *February 1st*, 1928.

Directional Relays.

In the letter which appears in your issue of to-day, under the above heading, Messrs. Nalder Bros. & Thompson make use of a definition of the word "efficiency" which, whilst quite in accordance with the tenets of the lay Press, and, incidentally, very helpful to your correspondents' argument, really cannot be allowed to pass unchallenged in an engineering journal. To the electrical engineer, the term "efficiency" always conveys the idea of a comparison between the mechanical output and the electrical input of a particular piece of plant. Doubtless what your reporter wished to convey when describing the directional relay exhibited by us at the Physical Society's Exhibition was that the dynamometer principle therein employed was inherently capable of a higher efficiency than the induction principle, a fact which Dr. Drysdale and others have amply substantiated.

In order to disprove this, your correspondents refer to a particular relay of their make which they say requires .006 VA, and compare it with a particular relay of ours, which, according to your reporter, consumed .03 VA at the operating point. It would be as logical to argue that a domestic fan motor, in virtue of its smaller consumption, was "infinitely more efficient" than a 100-h.p. ventilating motor.

The volt-ampere input is purely a question of the working forces, or "ruggedness" of the relay, and in our experience a consumption of .03 VA for a current setting of 10 per cent. of full load (corresponding to 3 VA at full-load current) is a convenient figure and one which does not throw an undue burden on the current transformers. If, on the other hand, a lower volt-ampere consumption is desired for any special purpose, it can be reduced to even less than .006 VA mentioned by Messrs. Nalders. In our view, in nine cases out of ten this is quite unnecessary, and, therefore, inadvisable.

Messrs. Nalders go on to say that your reporter did not state the consumption at full load, and they "can only assume" that the volt-ampere consumption of a relay taking .03 VA at 1/10 load will be "much in excess of that" of one taking .006 VA at 1/10 load. Their somewhat guarded assumption is axiomatic, and possibly the reason your reporter did not specifically state the consumption at full load was that he "could only assume" that your readers would be well aware that if the current was increased ten times, the volt-ampere consumption would be increased one hundred times, and, further, that they would be able to multiply by 100 without his assistance.

As your reporter rightly points out, we have for more than 15 years insisted upon the necessity of compensating directional relays for the inevitable fall of voltage which accompanies a fault, and it is very gratifying for us to find that another maker has at last come to the same conclusion.

Everett, Edgcumbe & Co., Ltd.

London, *January 27th*, 1928.

The Quest of the Perfect Clock.

Those who have followed the recent correspondence on the perfect clock may be interested to note that Dr. de Sitter, the famous mathematician and astronomer of Leyden, has an important article in *Nature* for January 21st, in which he deals with the rotation of the earth and astronomical time. He points out that the free-pendulum clock at Greenwich Observatory promises to be able to keep time within a few hundredths of a second for a period measured in years.

With this clock, which realises Kelvin's dream, it may be possible to solve some of the most profound problems of nature. It may interest Dr. Robertson to note that these clocks are driven by impulses given at the centre point of the swing.

We English may feel much satisfaction at this praise from so distinguished a scientist as Dr. de Sitter, and even more that this striking success has been achieved by Mr. Hope-Jones's "Synchronome" system, developed and improved by an invention of Mr. W. H. Shortt, M.Inst.C.E. It is only too true that many of our firms are willing to leave the business of inventing to other nations, yet there is in our own nation a potential inventive ability which would be worth more to us than our holdings in foreign gold mines if only we would see our way to encourage it.

C. Turnbull.

North Shields, *February 1st*, 1928.

[Prof. de Sitter's important article was mentioned in our "Notes" last week.—EDS. ELEC. REV.]

The Use of D.C. Wireless H.T. Eliminators.

The installing of d.c. wireless eliminators in largely increasing numbers by inexperienced persons calls for the attention of the I.E.E. and the fire insurance companies, whose wiring rules and regulations are extremely stringent with regard to effective insulation of wires and domestic appliances, though the rules appear to be entirely disregarded when wireless receiving sets are connected to the town supply.

Apart from the fact that the average wireless set itself is not designed for use on town's pressure, in very few cases are output transformers connected to isolate the receiving set from the loud-speaker extension wiring, which more often than not consists of a poor class of bell wire or cheap flexible, stapled to the wall, which wiring under certain conditions might be constantly subject to the full mains potential to earth.

Further, no particular precautions are generally taken to insulate the celluloid l.t. accumulators to reduce the very appreciable risk of firing of celluloid due to surface leakage to earth.

It would be very desirable if insurance companies as a whole instituted regular inspection of electric light installations, for not only would it give peace of mind to the policy holder and, incidentally, relieve the onus which is placed on the shoulders of the electrical contractor, but it would go a long way to putting a stop to the shoddy work that is being installed and passed as satisfactory by the supply authorities concerned.

C. E. E.

February 4th, 1928.

Exposed Live Metal Parts.

I think perhaps the following reply to the note on page 111 of the issue of the ELECTRICAL REVIEW, dated January 20th, 1928, would be of interest to your readers.

On any earth-return supply system a holder of the type mentioned having one central electrode and an outer conducting cap is free from all risk of shock if the wireman takes the necessary precaution of ensuring that the cap is at all times, no matter what switching may be used, connected directly to the return wire of the system. This precaution having been observed, the holder can only give a shock if the return circuit be subjected to mechanical rupture at a time when the feed wire remains continuous to the cap of the lamp.

H. G. Batson.

Harrogate, *February 1st*, 1928.

[We referred to this procedure in our leaderette of February 24th, 1926, when we pointed out that the protection thus obtained was ineffective, not only because the return connection might be interrupted, but also because the polarity of the circuit might be changed at any time. The only safe course is to have no exposed metal connected with the circuit. —EDS. ELEC. REV.]

The Legal Position of a Receiver and Manager.

The correspondence in your columns regarding the legal liabilities of a receiver and manager is very interesting.

It has prompted me to bring to the notice of your readers the apparent ease with which credit is obtained by altogether unworthy people. Presumably the fierce strife between British manufacturers and traders for business, accounts to a great extent for this regrettable state of affairs.

The next stage of these gentry is the Bankruptcy Court, where affairs are "administered" in a way that leaves something to be desired.

I have before me details of a case which is probably of common occurrence. The debtor was adjudicated bankrupt in January, 1923, and the statement of his affairs showed liabilities to rank of £3,454. His assets realised £606, and the expenses incurred were £312. In January, 1928 (five years later) a first and final dividend of 9½d. per £ debt is paid.

Surely there is a strong case for less costly and much more expeditious administration in these cases?

Z Electric Lamp & Supplies Co., Ltd.
J. L. FLORENCE, *Secretary.*

London, *January 28th*, 1928.

Speak Up!

I read, with very great pleasure, the leaderette in your issue of January 13th, every word of which I can feelingly endorse. As an attender at numerous engineers' meetings of various kinds, I have often found myself wishing that the speakers were as fully conversant with the art of public speaking as they are with their subject; unfortunately their delivery constitutes a strong argument in favour of your remark to the effect that "Engineers, as a body, have a great reputation for being excellent workers, but poor speakers."

Your reference to those who participate in the discussions is also unfortunately too true; I have on many occasions vainly endeavoured to follow what was probably a most interesting exchange of opinions, had one only been able to hear what was being said. So long as this fault continues at our meetings and lectures, so long will they fail to exert their full attraction. In addition to congratulating you on ventilating a long-standing grievance, I welcome your suggestion that the attention of the lecturer should be drawn in no half-hearted manner to the necessity for making himself audible.

W. H. B.

January 23rd, 1928.

Standard Priced Lamps.

A large number of electricity supply authorities have already reached saturation point, and secured the bulk of the lighting throughout the main streets of many towns in this country, and any increased business must, of necessity, come from the side streets and residential properties.

One of the drawbacks to the more rapid development of giving supply to the masses is the present high cost of the electric lamp. A gas mantle may be purchased for a few pence, whereas an electric lamp costs from 2s. 3d. to 2s. 8d., and this places a consumer of electricity at a disadvantage when compared with a gas consumer. Owing to the high cost of lamps the poorer classes, even where electric light is in use by them, often purchase a pint of oil and use an oil lamp or candles, for short periods, because they are unable to afford the cost of a replacement should a lamp fail. This also has the effect of preventing those who would otherwise go in for a supply of electricity, from becoming actual consumers.

Foreign lamps are sold for sixpence each and, fortunately for E.L.M.A., these can only be obtained with difficulty, and are not stocked by leading retailers. Whilst not recommending the adoption of foreign lamps, I feel that huge profits are being made on the sale of lamps, and development would be considerably accelerated if the lamp manufacturers would seriously consider a reduction in their prices to suit the pocket of the smaller consumer. This would increase sales, reduce the cost of the point in wiring, and benefit the electrical industry generally. What have the lamp manufacturers to say about it?

J. M. Bowman,
Electrical Engineer.

Electricity Dept., Rhondda U.D.C., *February 3rd*, 1928.

Tenders for Housing Schemes.

Some of us small men are trying our best to do good work, for instance, in connection with Council housing schemes, by using cab-tire cables, shockproof switches, ironclad switch-fuses and proper dis-boards and good flexibles. We tender to a usually loose specification on these lines and probably get it accepted by the local authority, but it has to be sent to the Minister of Health, who orders the acceptance of the lowest tender irrespective of the materials it is proposed to use—price is the sole consideration with him, not value. If we are to get better work put into the smaller houses surely some sensible consideration should be given to the question by such a public body as the Ministry of Health.

An education authority invited tenders for the lighting of a school and required a deposit of two guineas, to be returned in the usual way. The so-called specification was apparently drawn up by the office boy; it was a farce from beginning to end, and the proposed lighting an absurdity. Why will not these public authorities employ an engineer for these jobs instead of letting people who know absolutely nothing about the work do it?

Tired.

January 25th, 1928.

Domestic Heating and the Load Factor.

I am very glad to see from Mr. Farrer's letter in your issue of January 27th that he mentions the matter of the two-rate tariff coming into its own again.

As your readers will know, I have been pressing this view for some time past. It is going to be a difficult matter for central stations to buy on a maximum-demand basis and to know just how to pass the charges on to the consumer.

A two-rate system, both in buying and selling, makes the matter very simple, and agreements can be so worded that the hours of high rate can be altered from time to time to suit stations, as there seems little doubt that the time of maximum demand will vary not only as between one locality and another, but also in the same locality as different types of load develop.

The two-rate system failed before because it was applied at a time when there was little other use of electricity except for lighting, and because the revenue per consumer was then so small. Both these conditions, of course, are changed now, and there is no question that the two-rate system is making headway all over the world.

Ernest E. Sharp.

London, *January 30th*, 1928.

Conditions of Living in Malaya.

I shall be greatly obliged if any of your readers can give me information, from actual experience, of the conditions for young electrical engineers in Malay, especially with regard to health, living conditions, and salary required to maintain a standard of living comparable with that prevailing in England.

R. H. Mead.

London, *February 6th*, 1928.

The Marking of Imported Lamps.

Merchandise Marks Act Inquiry.

AN application by the Electric Lamp Manufacturers' Association of Great Britain, Ltd., for an Order-in-Council under the Merchandise Marks Act, 1926, requiring that imported incandescent electric lamps should bear an indication of their origin, was the subject of an inquiry opened on February 6th by the Standing Committee (General Merchandise) appointed by the Board of Trade under the Act, Sir H. Llewellyn Smith presiding.

The E.L.M.A. claimed to comprise within its membership the manufacturers of 90 per cent. of the total British production of these lamps, and it was stated that, so far as could be ascertained, the present application was also supported by the 10 or 12 British manufacturers outside the Association. Four of these—British Electric Lamps, Ltd., Nelson Electric Works, Ltd., Omega Lamp Works, Ltd., and Messrs. Poynter, Griffiths & Co., Ltd.—had intimated their support by letter. The application was restricted to complete lamps, ranging from the large 10,000-candle-power lamps such as those used in lighthouses, down to the small flash-lamps used in torches, and excluded wireless valves and mercury-vapour lamps. The

indication of origin, it was proposed, should be applied to the glass bulbs of the completed lamps in cases where the lamps were large enough to permit it, and in the case of the smaller lamps it should be applied to the metal caps. A suggestion made by Mr. Kenneth Swan (counsel for the applicants, who is the son of Sir Joseph Swan, the inventor of the original carbon filament lamp) was that, inasmuch as the wattage was indicated on each lamp it might be convenient to indicate that lamps above a certain wattage should be marked on the bulbs, and that those below that wattage should be marked on the caps. The applicants also asked that the imported lamps should bear the necessary marking at the time of importation as well as at the time of sale. It was pointed out that if it were necessary to have the goods marked only at the time of sale, there would be difficulty in detecting and proving infringements of the Order, because it was so difficult to distinguish between British and foreign lamps in the absence of marks. Another point made was that in any case the marks should be applied at the time of manufacture of the lamps, if those marks were to be sufficiently indelible.

The application was opposed by Messrs. Philips Lamps, Ltd., and the Tungsram Electric Lamp Works (Great Britain), Ltd., who import lamps. They held that the proposed marking of imported lamps was unnecessary, on the ground that the bulk of British lamps were marked with an indication of origin. They also held that the persons who bought the foreign lamps knew them to be foreign, and that there was no deception. The applicants replied that British manufacturers had adopted marking in self-defence, and in defence of the public, in order to avoid deception, because in the absence of marking it was impossible to distinguish between a British and a foreign lamp without the very closest examination. They agreed that the lamps imported by the two opposing companies were marked with an indication of origin, and that they were of the highest quality.

Mr. A. S. COMYNS CARR, K.C. (for the opponents) maintained that the making of an Order applying only to complete lamps and not to parts would encourage dealers to import parts and assemble them in this country. Then they could not only evade the Order, but could even mark the lamps so assembled as being British.

Mr. C. W. SULLY, director of the E.L.M.A., replying to this point, said that they did not ask that every lamp marked "British made" should be wholly produced in this country. If parts were imported the bulk of the work would remain to be done in this country.

Mr. J. Y. FLETCHER (General Electric Co., Ltd.) said that the public was unable to distinguish between British and foreign lamps. Companies with English-sounding names distributed imported lamps here. One of them actually had on its notepaper the picture of an English factory which it had long since given up.

During the second day's proceedings Mr. C. H. Cox (Edison Swan Electric Co., Ltd.) gave evidence as to the difficulty of distinguishing between British and foreign lamps, and said that the cost and trouble of marking lamps, as suggested, was negligible. Mr. G. H. Percival, of the same company, corroborated Mr. Cox's statements.

Mr. J. W. CURRY (Lever Bros.), speaking as a large purchaser of lamps, said that it was not easy to differentiate between British and foreign lamps; he always made a practice of buying marked British lamps only.

Mr. T. E. ALGER stated that large quantities of cheap lamps were being hawked about in connection with assisted wiring schemes.

This concluded the evidence for the applicants.

Mr. COMYNS CARR alleged that certain members of the E.L.M.A. purchased Philips' lamps and put them into stock, but this was denied.

The opponents decided not to call evidence. It was agreed between the parties that if an Order was made, the existing stocks of Philips and Tungsram lamps would be allowed to be sold, although they would not comply with the Order. The fear was expressed that the high reputation gained by these two makers would be shared by inferior Dutch and Austrian lamps, which would have to be marked in exactly the same manner.

The decision of the Committee will be announced in due course. A fuller report of the proceedings will appear in our next issue.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1926.

17,543. "Thermionic amplifying means and associated electrical systems." W. J. Ricketts and E. E. Smith. July 13th, 1926. (283,602.)

17,661. "Motor mechanism actuated by springs and electromagnetic impulses. O. Muck. July 14th, 1926. (283,603.)

19,851. "Process of making vacuum tubes." Dr. S. Loewe. August 11th, 1925. (256,975.)

24,708. "Electrical installation fittings." G. R. Brown. October 5th, 1926. (283,617.)

25,096. "Electrical signalling devices for automobiles." S. A. Currin and Clayton Wagons, Ltd. October 8th, 1926. (283,620.)

25,252. "Transmission of polyphase currents from transformers to electro-thermic furnaces." Akt.-Ges. für Stickstoffdunger. October 14th, 1925. (259,958.)

25,276. "Terminal connectors and the like." D. E. Barnett. October 11th, 1926. (283,629.)

25,336. "Electric welding apparatus." W. Woodhouse and Westinghouse Brake & Saxby Signal Co., Ltd. October 11th, 1926. (283,630.)

25,330. "Automatic switches." H. J. Poole. October 11th, 1926. (283,631.)

25,499. "Transmission of movements to a distance." Siemens & Halske Akt.-Ges. February 9th, 1926. (Addition to 262,395.) (265,917.)

25,506. "Means for indicating the speed of alternating-current motors." British Thomson-Houston Co., Ltd., and H. Dreghorn. October 13th, 1926. (283,638.)

25,634. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., L. M. Simpson, and A. J. Ray. October 14th, 1926. (Cognate application 14,227/27.) (283,643.)

25,730. "Railway signalling systems." Automatic Telephone Manufacturing Co., Ltd., and R. W. Tarrant. October 15th, 1926. (283,649.)

25,742. "Electrical method and apparatus for identifying chemical elements and compounds and biological organisms." M. E. Simon and J. A. O'Connor. October 15th, 1926. (283,650.)

25,759. "High-frequency amplifying systems." Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). October 15th, 1926. (283,651.)

25,864. "Protection device for electric meters, demand indicators, and fuse boxes." D. E. Rees. October 16th, 1926. (283,656.)

27,217. "Distribution boards for electrical installations." S. G. Leach. October 30th, 1926. (283,671.)

28,412. "Electrical signalling and recording systems." E. W. Baker and A. E. Lomas. November 11th, 1926. (283,680.)

28,744. "Device for preventing over-heating of electric flat-irons." H. Muhlenbrock. November 15th, 1926. (283,684.)

28,849. "Enclosed electric fuses." English Electric Co., Ltd., and F. N. Linstow. November 16th, 1926. (283,688.)

30,014. "Electric lamp holders." R. Nettl. November 27th, 1926. (283,696.)

30,117. "Means of recording and amplifying the record of the presence of electric charges or of any objects." W. E. Boyd and T. Stewart. November 29th, 1926. (283,700.)

31,011. "Laminated electrically conducting brushes." General Electric Co., Ltd., and A. E. Angold. December 7th, 1926. (283,705.)

31,158. "Electric heaters and boiling plates." Measurement, Ltd., and F. Thorp. December 8th, 1926. (283,706.)

31,669. "Electric contacts." Sykes & Dyson, Ltd., P. Sykes, and W. Cooper. December 14th, 1926. (283,713.)

31,896. "Electric switchgear." British Thomson-Houston Co., Ltd., and H. C. Heath. December 16th, 1926. (283,714.)

32,804. "Apparatus for measuring frequency with oscillating electric crystals." Radiofrequenz Ges. and H. Eberhard. December 29th, 1925. (263,841.)

33,054. "Plug switches for wireless-telephone and telegraphic apparatus." Igranic Electric Co., Ltd., and S. R. Wright. December 31st, 1926. (283,727.)

1927.

725. "Clockwork-operated electric time switch." C. Houselander. January 10th, 1927. (283,733.)

1,884. "Telephonic exchanges." A. C. Brockies. January 21st, 1927. (283,742.)

2,545. "Electric discharge devices." British Thomson-Houston Co., Ltd. January 28th, 1926. (265,922.)

4,154. "Picture telegraphy, high-speed facsimile telegraphy, and the like." Telefunken Ges. für Drahtlose Telegraphie. February 15th, 1926. (266,009.)

6,097. "Circuit system for feeding the anodes and filaments of electron tubes, especially in connection with the alternating-current circuit." R. Ettenreich and E. Schrack (trading as Radiowerke E. Schrack). June 10th, 1926. (272,446.)

7,129. "Ships' bulkhead lamp fittings." A. Chalmers. March 15th, 1927. (283,764.)

9,148. "Electric cut-outs or circuit breakers." C. Arnold (Scheiber and Kwaysser Ges.). April 2nd, 1927. (283,769.)

12,131. "Apparatus for screening secondary X-rays by means of a screen rotatable about an axis." F. Leiser. May 5th, 1926. (270,739.)

14,918. "Electrodynamic devices for use in acoustic devices, such as loud speakers." Electrical Research Products, Inc. August 4th, 1926. (275,567.)

15,713. "Ray-condensing disk for head-lights of motor-cars and like lamps." P. Roy. April 5th 1927. (283,788.)

16,874. "Sound amplifiers for sound-reproducing apparatus" R. Frenkel. June 24th, 1927. (283 796.)

17,312. "Manufacture of evacuated luminous tubes and the like." Electricite Industrielle et Domestique. July 3rd, 1926. (273,726.)

18,639. "Electrical measuring instruments." Etablissements E. Jaeger. August 2nd, 1926. (275 207.)

18,953. "Devices for protecting the exhausting-socket of mercury lamps or the like consisting of glass." Jenaer Glaswerk Schott & Gen. August 2nd, 1926. (275,214.)

20,271. "Automatic cut-out for electric circuits." A. Schuman. February 24th, 1927. (Addition to 283,430.) (283,802.)

21,201. "Safety clutches for electrical anchor winches, haulage capstans, and the like." Atlas-Werke Akt.-Ges. October 1st, 1926. (278,326.)

23,365. "Switch mechanism and cable connections for electrical mining apparatus." W. Rea. September 6th, 1927. (283,812.)

24,446. "Bases for incandescent lamps or similar articles." British Thomson Houston Co., Ltd. September 20th, 1926. (277,685.)

24,556. "Incandescent electric lamp-holders." E. Conradty and O. Conradty (trading as C. Conradty (firm of)). June 24th, 1927. (283,817.)

25,847. "Diaphragms for sound-reproducing devices." British Thomson-Houston Co., Ltd. October 1st, 1926. (278,376.)

26,799. "Electric motor control systems." J. B. Price. October 9th, 1926. (278,754.)

27,003. "Electrical fuses or cut-outs." J. A. Crabtree. October 12th, 1927. (283,829.)

28,143. "Apparatus for operating railway points or switches." General Railway Signal Co. January 12th, 1927. (283,454.)

32,421. "Manufacture of electron-emitting bodies." Westinghouse Lamp Co. December 1st, 1926. (281,687.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from February 1st:—

M.V.C. (lettering and design). No. 485,965. All goods in Class 5.—Metropolitan-Vickers Electrical Co., Ltd.

Helikon (lettering and design). No. 474,292. Class 8. Electrical instruments and apparatus for use in connection with radio-telegraphy and telephony.—Helikon Wireless Co., Ltd., 36, Camomile Street, E.C.3.

Radicle, sole makers, Hawkins & Soffe, London, N.W.1 (lettering and design). No. 484,420. Class 8. Loud speakers and transformers for use in radio-telegraphy and telephony.—J. B. Hawkins, trading as Hawkins and Soffe, 56, Crosland Road, N.W.1.

Hercules. No. 486,587. Class 8. Radio-telephonic apparatus and parts thereof.—Boynton & Co., Ltd., 34, Bradford Street, Birmingham.

Margo. No. 485,627. Class 18. Electric hot plates and water heaters.—Kummler & Matter Gesellschaft, Aarau, Switzerland (British representatives: De Brunner & Lang-Sims, 3-4, King Street, W.C.2.)

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ATHERTON.—Housing scheme (34); surveyor to U.D.C., Town Hall.

AUDENSHAW.—Greyhound track; Audenshaw Race Course, Ltd.

BATHGATE.—Creamery at Bridgend, for Scottish Co-operative Wholesale Society; the manager, Glasgow.

BEDDINGTON AND WALLINGTON.—Houses (37), Bandon Hill, for J. Midmer.

BEDWELLTY.—Additional 60 houses, for the U.D.C.; surveyor.

BENTLEY (NEAR DONCASTER).—New middle school and caretaker's house; West Riding Education Department, County Hall, Wakefield.

BILLINGHAM (STOCKTON-ON-TEES).—Billiard hall, Hope Street, for T. Malcolm. School, for Durham E.C.; F. Willey, architect, 34, Old Elvet, Durham.

BOLTON.—104 houses, Paulham Street site: 96 at Tonge Moor; borough engineer. Packing works and stores, Mallinson Street; H. Pilling. Boiler house and shed extensions, Milton Mills, Mule Street; Henry Bond and Co., Ltd.

BRIERLEY HILL.—Cinema, High Street, for A. L. Hawkins, Oldbury; Stanley A. Griffiths, architect, Stourbridge.

BROMLEY (KENT).—Extensions to Farnborough institution (£26,000), for the Board of Guardians; J. B. Edwards and Co., builders, Piccadilly, London.

CARDIGAN.—Casual wards (£6,000), for the Board of Guardians; clerk.

CLAYBURY.—Electricity supply, mental hospital; L.C.C.

CLITHEROE.—Electric lighting, Grammar School; governors.

CRAYFORD.—Central school (700 places), for Kent E.C.; Director of Education, Sessions House, Maidstone.

CROYDON.—Church, Virginia Road, for the United Methodist trustees. Church, Streatham Vale, for the Wesleyan trustees. Offices and shops, High Street and West Street; Hitchcock & Pearce, Ltd. Motor showroom, Blunt Road; A. M. Scott.

DAGENHAM.—Church, Schroffold Road; Church of England authorities.

DARLINGTON.—Extensions to library (£25,000), for the T.C.; E. Minors, borough surveyor.

DEVIZES.—School, for St. Joseph's Roman Catholic managers; priest-in-charge.

EPSOM.—Bank, High Street, for the National Provincial Bank, Ltd.

ERITH.—Business premises and assembly hall, Belvedere, for the Royal Arsenal Co-operative Society, Woolwich, S.E.

GLASGOW.—Buildings, Templeton Street; James Templeton and Co. 82 houses, Jordanhill; Maxwell, Hodgson and Co.

GUILDFORD.—Workshops, Woodbridge Road; Ingram, Perkins & Co., Ltd.

HARTLEY WINTNEY (HANTS.).—Extensions, Winchfield Infirmary (£9,858), for the Board of Guardians; clerk.

HAYES.—Girls' secondary school, for Kent E.C.; Director of Education, Sessions House, Maidstone.

HERTFORD.—Housing scheme (152), for the T.C.; borough surveyor, The Castle.

HIGH WYCOMBE.—Additional 100 houses, for the T.C.; borough surveyor.

HOUGHTON-LE-SPRING (CO. DURHAM).—Additional 34 houses; B. Richardson, surveyor.

HULL.—Laundry block, &c., Cottingham (£12,500); city architect. Additional 400 houses, for the T.C.; borough engineer. Running shed for 60 'buses, for the T.C.; borough surveyor.

JEDBERGH.—Conversion of Canongate Mills into silk factory, for a new company.

LANARKSHIRE.—Maternity hospital for Middle Ward; county clerk.

LANCHESTER.—Divisional stores, Durham C.C.

LEEDS.—300 houses and 100 flats, York Road, and 150 houses, Meanwood; city engineer.

LEICESTER.—Extensions, Collegiate Girls' School; P. Beck. mental institution, Leicester Firth; medical officer of health.

LLWYNGWRIL (MERIONETH).—Children's convalescent home, for Miss M. S. Davies, Gregynog, Newtown; A. Stanley Hill, architect, Seven Square, Newtown, Mont.

LONDON (E.C.).—Extensions, City of London School; Governors.

(BARKING TOWN, E.).—Isolation hospital; U.D.C.

(ILFORD, E.).—Saw mills and joinery shop, Springfield Gardens; J. Aldridge. Extensions, Ilford Emergency Hospital; C. J. Dawson & Son & Allardyce. Printing Works, Grove Road; W. R. Lone. Primitive Methodist Church, Meads Lane; G. Baines & Son. Factory, Grove Road; A. A. Bluemel. Catholic church, Cranbrook Road; T. H. B. Scott.

(WEST HAM, E.).—School, Tidal Basin, for the borough E.C.; John H. Jacques, architect, 61, West Ham Lane, Stratford, E.

(KILBURN, N.W.).—Extension of the Kilburn Palace, Belsize Road, for United Picture Theatres, Ltd., 3, London Wall Buildings, E.C.

(ST. PANCRAS, N.W.).—Buildings (£400,000), on the Ossulton Street area, for the L.C.C.; Council architect, County Hall, Westminster, S.W.

(CAMBERWELL, S.E.).—Cinema, Old Kent Road; J. A. Emes, architect.

(LEWISHAM, S.E.).—Secondary school, Bampton Road; L.C.C. Education Committee.

(BATTERSEA, S.W.).—308 flats, Whidborne estate; Larkhall Estate, Ltd.

(BRIXTON, S.W.).—Ticket printing works, for L.C.C., Effra Road; W. H. Gaze & Sons, Ltd., Kingston.

(WANDSWORTH, S.W.).—Hall, York Road; Salvation Army.

(WIMBLEDON, S.W.).—Office, garage and petrol stores, Wimbledon Hill Road; F. W. Davey. Refuse and sewage plant; Hadfield & Brocklesby.

(W.C.).—Improvements, Royal Opera House, Covent Garden; Grand Opera Syndicate, Ltd.

LUDLOW.—Grammar school extensions (£9,108) for the governors; clerk.

MANCHESTER.—380 houses, Green End estate; disinfecting station and garage, Monsall Hospital (£19,000); dust destructor plant (£25,000); city engineer.

MANSFIELD.—Housing scheme (100), Ravensdale estate; borough engineer.

MORECAMBE.—Ice skating rink; borough engineer. Mineral water works, Alice Street; Morecambe Direct Supply Co.

MORETONHAMPSTEAD.—Houses (28), with electric lighting, for the Parish Council.

MOTHERWELL.—Repair shop, Hamilton Road, for the Lanarkshire Tramways Co. (£35,000).

NEWPORT (SALOP).—Grammar school extensions (£12,500), for Salop E.C.; director of education, Shrewsbury.

NORTHAMPTON.—Warehouse, factory and offices, Chaucer Street; Goodliff Manufacturing Co., Ltd. Works extensions, St. James Park Road; Dover, Ltd.

OVERTOWN.—Re-housing scheme (124), for Lanarkshire C.C.; clerk.

PRESTON.—Housing scheme (147); W. Platt, borough engineer, Town Hall.

ROWLEY REGIS.—Housing scheme (40), for the U.D.C.; surveyor, Old Hill, Staffs.

SALE.—Housing scheme (44), for the U.D.C.; surveyor.

SALFORD.—Extension of hospital union infirmary; clerk to Board of Guardians.

SHEFFIELD.—50 houses, Longley estate; S. Higton & Sons. 176 houses; Sutton trustees. 45 houses, Longley estate; G. H. Bodell. Repair depôt, Stubbin estate; city architect. Disinfecting and cleansing station, Penistone Road; Cleansing Committee.

SKEGNESS.—Alterations, Lumley Road, for Woolworth and Co.; company's architect.

ST. ALBANS.—Extensions, Institution (£25,700), for the B.G.; E. F. W. Hieatt, clerk.

STOKE-ON-TRENT.—198 houses, Trent Vale estate; Sutton trustees.

SUNDERLAND.—Two elementary schools; Education Committee.

SWANAGE.—Grammar school (£21,098), for Dorset E.C.; F. and E. Small, builders, Taunton.

TONBRIDGE.—Additional 50 houses for the U.D.C.; surveyor.

ULVERSTON.—Branch library, County Square; Lancashire Education Committee.

WATFORD.—Vagrant wards and master's house, for the Board of Guardians; A. Saxon Snell & Phillips, architects, 9, Bentinck Street, Manchester Square, London, W.1.

WELLFIELD.—School (£28,000); Durham county architect.

YORK.—Postal sorting office for H.M. Office of Works, King Charles Street, London, S.W.